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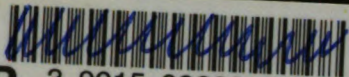
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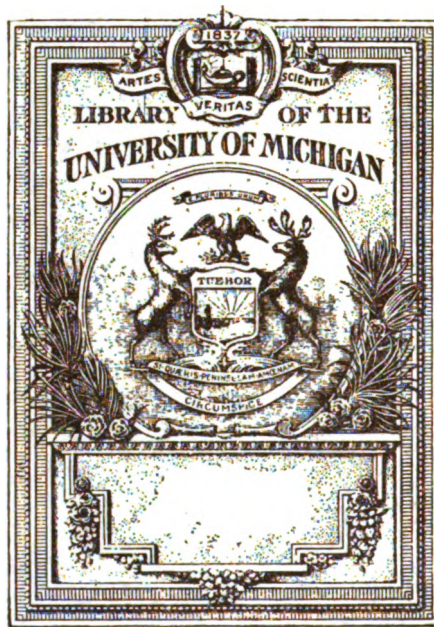
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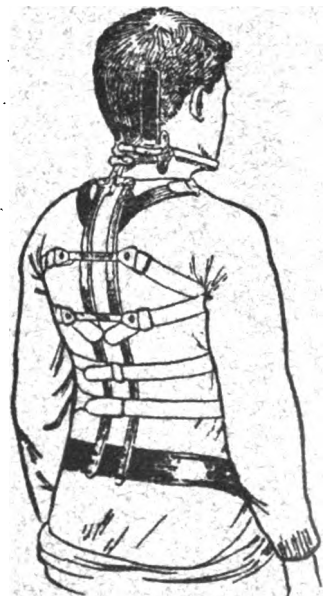
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## OBSERVATIONS ON THE TREATMENT OF TUBERCULOUS ARTHRITIS.

WITH SOME STATISTICS FROM THE NEW YORK STATE HOSPITAL FOR THE  
CARE OF CRIPPLED AND DEFORMED CHILDREN.

BY JOHN JOSEPH NUTT, B.L., M.D., NEW YORK.

THAT we may the more clearly discuss the matter of treatment, we must have some standard of prognosis. If the patient is a child and comes under treatment early, and only one joint is involved, and perfect control of the case is had, recovery with good functional movement and with little or no deformity may be expected. The one exception I would make is in infection in the upper part of the spine. Here, it has been impossible in my experience to avoid deformity.

Delay in coming under surgical care, involvement of more than one joint and imperfect control of the patient mitigate the chances of a cure with a movable joint and without deformity. Where deformity is already marked and destruction of bone is already present, the prognosis is an ankylosed joint with some deformity.

If the patient is systemically tuberculous or septic, the prognosis as to life is grave.

In adults the conditions are so altered that it is almost as though another disease were being treated. The prognosis depends much more on the extent to which the entire body is involved than it does in children: whether there is a general tuberculous condition present with the involvement of a joint incidentally as it were, or whether the chief and perhaps only site of activity is in the joint. In the former case the prognosis is bad and operation serves only to hasten the end. In the



latter case operation is the procedure of choice if the joint is easily accessible, and a cure with the loss of joint function may be expected.

Under these observations we have to consider treatment as applied both to the general and to the local condition.

I believe many tuberculous joints are cured with improvement of the general condition and with no specific treatment directed toward the joint itself, just as tuberculous infection of other tissues, as glands, lungs and so forth are cured through treatment of the systemic condition. On the other hand, I do not believe a tuberculous joint in a child was ever cured with any treatment whatsoever, if the general condition failed to improve.

Therefore, the most essential thing in the treatment of a tuberculous joint in a child is to attend to the general condition of the patient. When every requisite for this cannot be provided in the home, hospital care is necessary. For this reason children of the poorer classes should be provided with active hospital care from the time of diagnosis until the disease is cured, *i.e.* arrested, and the likelihood of a recrudescence reduced to the minimum.

As the normal functioning of every organ depends upon the healthy activity of one or more other organs through what I understand Starling to mean by hormones, a detailed care of the body must be given. Respiration, circulation, digestion, excretion, exercise, rest and mentality are each to receive consideration. An adequate supply of proper air must be furnished and proper breathing performed. The more important factors regarding the air are the currents, humidity, and the temperature or possibly the variations in the temperatures, daily or even hourly. Probably oxygen is always present in sufficient amount. Bad air is usually bad because of other qualities than foul gases or dust or other impurities. Whatever the reason, whether it is entirely due to improved respiration or to stimulation of blood pressure, as I am inclined to believe, outdoor life is beneficial. The patient should be outdoors twenty-four hours a day. A sparsely settled neighborhood is desirable and the country is unquestionably preferable to the sea-shore. The latter statement is based upon personal experience with hospitals in each location. While the mean temperature of a spot inland may be the same as that of a place on the sea-shore, the variations are more marked and more frequent inland. Moreover, the currents of air at the sea-shore are much more constant as to direction, velocity and humidity, and it is the variation in these qualities which provides the therapeutic effects which most of these patients derive from outdoor life. Furthermore, ambulatory cases find it very difficult and often injurious to walk in the

sand; there is only choice between the sunshine and absolute shade, while the shade in a grove of trees permits one to have "attenuated" sunshine, and the children find much more to interest them in the life of the country.

The diet need not be restricted except for specific reasons. Until we know more than we do about diets, a mixed one is to be recommended. Perverted taste should be corrected, while personal preferences should be humored if not absolutely contra-indicated. Regularity as to feeding is to be insisted upon. A lagging appetite should be spurred by any means possible. A very little child may eat with a relish, if a little mothering and personal attention and patience are shown. It is well worth while to do this spoiling. Older patients may prefer a different-colored tray or a plate with less upon it. Humoring often does more to encourage an appetite than any medicine. Time spent in studying the personal equation in a case of lack of appetite is well spent.

With the temperature above 100 and with albumen and casts in the urine, a milk diet is to be tried. However, I have had cases with temperature which did better on a regular diet and also cases in which albumen was unaffected by diet.

The bowels must move well, daily. The quantity of urine of twenty-four hours should be measured frequently. Should it be below normal, water should be prescribed at regular intervals. Other diuretics are seldom necessary.

The skin should be kept active by frequent cleansing and by the stimulating effect of air baths, in the sun if possible.

In using the word "mentality," I wish to refer to the importance of happiness in the treatment of these patients. Their state of mind may affect their appetite, their digestion, their sleep and, in fact, influence potently the progress of their treatment.

In so far as the local treatment permits, these patients should be allowed to run and play about like other children. Exercise raises the blood pressure, sending more blood to every part, to the source of the antibodies and to the diseased joint as well.

Rest, aside from any consideration of the joint, is more necessary than it is with healthy children. It is well to have one or two rest periods during the day for the patients who are up and about.

As to the local treatment: A short time ago, I heard an orthopedic surgeon state that he would not accept a child with Pott's disease as a patient, unless he was promised that there would be no interference with his treatment with a gas-pipe frame for a year at least. It seems to me that there are certain conditions both of the joints and of the patients

which, rather than the location alone, must determine our treatment, and even then it is frequently necessary to change the treatment from that originally planned. A well-nourished child may be strapped to a frame for months without any ill effects, while another of the same age might do very poorly indeed. I always prefer to have the local treatment interfere as little as possible with the exercise of nature's normal functions. So beneficial is every added muscular movement that I prefer, when bed treatment is necessary, to keep the child in bed with a well adjusted brace, rather than on a frame. With the brace, the child can turn over and roll about. Even were immobilization more secure on a frame than in the brace, which it usually is not, in most cases the fight with the tubercle bacilli will be quicker won with the increased systemic resistance and battling power of the braced child.

However, there are conditions met more efficiently by the frame than a brace, one of which is extension. If the disease is discovered early and a plaster of Paris dressing applied, it will not be a good fit after a few days, so quickly does atrophy set in. Later in the disease, atrophy proceeds more slowly, and a plaster dressing will fit for a longer period. However, plaster-jackets are not hygienic in themselves, and they cannot be easily readjusted if uncomfortable, and cannot be refitted if inefficient. A brace can be readjusted every day, if necessary, and the patient's skin can be kept clean and healthy. One reason why many use plaster of Paris in preference to a brace is that it cannot be loosened or removed by the parents, while the brace can be. Yet, I find few parents who will not follow instructions, if they are instructed with care and precision. Braces should not be removed by any one except the surgeon, until convalescence is established.

If the disease is well advanced when treatment is begun and the child is placed on the convex gas-pipe frame, there is danger of the curve of the frame being too exaggerated and causing such great extension of the spine as to injure the diseased area.

At the hip joint, most orthopedic surgeons now use either a traction brace or a plaster spica. In this country, where its value was first noted, traction is used to a greater extent than it is abroad. One foreigner applies a spica, usually a short one, extending to the knee, which he allows to remain in place, or applies another one when a change is necessary, until the disease is cured with a firm bony ankylosis. When this takes place he corrects the deformity by a subtrochanteric osteotomy. The result he expects is a useful leg, with the loss of the joint, and in his opinion the greater probability of a permanent cure.

To those of us who see the value of giving constant attention to the

details of treatment in hip joint disease, such treatment as Lorenz advocates seems to approach neglect.

The reason many have become discouraged in their attempts to obtain a movable joint has been that after the discharge of the patient the disease has re-appeared. If an absolute cure is not obtained limited movement in the joint will tend to reawaken the disease. Therefore a cure must be absolute in the sense that the resistance of the joint must be well tested. My test is the removal of all protection and frequent examinations over a period of six months without the re-appearance of a clinical sign of disease-activity.

When deformity exists no attention need be paid to it until treatment has been under way for several months. The reason is that with proper treatment the deformity, which is at first caused by spasm, will of itself disappear. Various apparatuses have been designed and are very efficient for the reduction of the more obstinate deformities. The question of giving an anesthetic for the purpose of reducing a deformity should be considered with care. Under no circumstances should great force be used to overcome a deformity. Such correction as will take place simply from the anesthetizing of the patient, will seldom do any harm.

Using force to increase the range of motion of a tuberculous joint is a very dangerous procedure. Gentle daily passive movements may be used, if care is taken to watch closely for any activity of the disease.

The earliest sign and the last to disappear is nature's endeavor to protect the joint from traumatism, and this gives us our clew to treatment. By studying this sign, we are enabled to determine whether our treatment is efficient, no matter whether we are using a brace, plaster of Paris or a frame, or whether we are allowing the child to be up part of the day or all day. When these signs increase upon our permitting more freedom to the patient, we know that we must return to greater protection of the joint.

This apprehension of traumatism may be seen very frequently in the face of the child, in its method of walking and standing, and locally may be found in the joint. This look of apprehension may be present in the face of the child wearing a brace or a plaster-of-Paris dressing and being jostled and jarred over the city streets in a wagonette while it is being taken from its home to the school for crippled children where it is to receive a cup of hot soup and learn to spell "dog." I would not for the world attempt to discourage amateur philanthropists in this field of endeavor were it not that they are helping to postpone the day when continuous, extra-urban hospital treatment will be afforded each of these little sufferers. The orthopedic treatment of these children of

the crippled schools is the best possible under the circumstances, but the circumstances are not of the best.

Bier's treatment, that of passive congestion, is of very little value in my estimation. I have used it in many cases of knees and ankles and have now discarded it.

Eight years ago tuberculin was tried by me for a period of about eighteen months on hospital patients. Careful records were made of the condition of the joint and of the general condition of each patient, together with frequent examinations of the opsonic indices. The laboratory work was done by Hastings. My conclusion is that it is of no other use than that of a good general tonic. A report of our work was presented to the American Orthopedic Association and published in the *JOURNAL* of August, 1908.

Heliotherapy was given a careful and conscientious trial for a period of over a year, both at Sea Breeze Hospital and at the State Hospital. Rollier's method was followed as closely as possible. While most of the cases improved under this treatment and some sinuses closed, the improvement in most of the cases would have been expected without the aid of the sun's rays being used in this way. That sunlight is beneficial has been recognized for many years, but I have been unable to find any specific action in its use in these cases.

The use of bismuth paste as advocated by Beck of Chicago has been discarded by me. I had a number of remarkable successes with it, closing sinuses within a few months which had been open for long periods, one for eight years. However, some less fortunate results lead me to believe it is not without its grave dangers and that it is impossible to tell when it is a safe procedure.

I have spoken above of my idea that the increase of blood pressure in these patients is highly beneficial. I have found that a patient's blood pressure is increased very quickly after being removed from the ward to a place out of doors. It may be that raising the blood pressure by some such means as dumb-bell exercises when it can be done without injury to the infected joint, may have the same results as have some of our present therapeutic measures.

Operation for immobilization of the spine by bone-graft is being done very extensively and doubtless its usefulness will be fully determined within another year or so. It would seem as though the adult cases offered a much wider field for such radical procedure than do children. In the former, prolonged treatment is usually deleterious to the patient mentally, even if the lost time is not a serious consideration, and as stated above, the disease is much more likely to be a local affair.

Statistics of the patients of the New York State Hospital for the Care of Crippled and Deformed Children, who were treated for tuberculous arthritis and were discharged before April 1, 1915:

Hip	62	54%	m 39	53%	of all males under treatment for tuberculous arthritis.
			f 23	57%	of all females under treatment for tuberculous arthritis.
Spine	29	25%	m 22	30%	
			f 7	17%	
Knee	20	17%	m 12	16%	
			f 8	20%	
Ankle	1				
Wrists	1				
Total	113				

## DISCHARGED AS:

Cured	53	46%	m 38	f 15
Improved	43	38%	m 25	f 19
Unimproved	5		m 5	
Transferred	2		m 1	f 1
Removed by Parents	3		m 1	f 2
Died	7	6%	m 4	f 3
Total	113			

Average time under treatment: all cases; 2 years, 7 months, 9 days.

Average time under treatment cured cases: 3 years, 5 months, 15 days.

## CURED CASES

Hip	30	48% of all hips	m 22	f 8
Spine	12	41% of all spines	m 9	f 3
Knee	11	55% of all knees	m 7	f 4
Total	53	46% of all cases	m 38	f 15

## IMPROVED CASES

Hip	24	38% of all hips	m 12	f 12
Spine	12	41% of all spines	m 9	f 3
Knee	6	30% of all knees	m 3	f 3
Ankle	1			
Total	43	38% of all cases	m 25	f 19



Brick yard laborer  
Refinisher  
Stenographer  
Dressmaker  
Music teacher  
House work  
Farm hand

In examining these statistics it should be borne in mind that all are charity patients, many coming from institutions and almshouses, and are, therefore, especially difficult to follow up after discharge.

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## OPERATION FOR RELAPSED CLUB-FOOT.

BY ANSEL G. COOK, M.D., HARTFORD, CONN.

TARSECTOMY has been practised for so many years and by so many surgeons that I am quite unable with any degree of certainty to give credit to the originators of the operation. It is so simple, so easily performed, so safe and the result so surprisingly satisfactory I feel that it would be more universally practised if it were thoroughly understood by the profession. I therefore present for your consideration an exact description of the operation which, in my personal experience, has proved the most useful.

This is an operation for relapsed club-foot, cases that have resisted the ordinary methods of treatment. There is no age limit, no preliminary treatment and no after treatment beyond the time required for the healing of the wound.

First: If necessary subcutaneously divide the fascia on the inner side of the foot and also the heel-cord; then bring the foot into as good position as possible, using nothing but the hands and being careful not to bruise the tissues.

Second: Make an incision through the skin and superficial fascia just in front of the external malleolus on the outer side of the foot. The skin incision should be perpendicular from the bottom of the foot to just above the bend of the ankle.

Third: With an osteotome remove a large wedge of bone; make the first incision far back, just in front of the fibula. Pay no attention to



the periosteum or peronei tendons. Cut the bones *completely across* and remove everything. Be sure to make the wedge large enough.

The foot can now be brought without force into excellent position, and by giving the anterior part of the foot a quarter turn, its outer border can be elevated. It is vitally essential to the success of the operation that the outer border of the foot be elevated. In order to do this the tarsus is cut completely across to enable the operator to give the anterior foot the quarter turn which elevates the outer border.

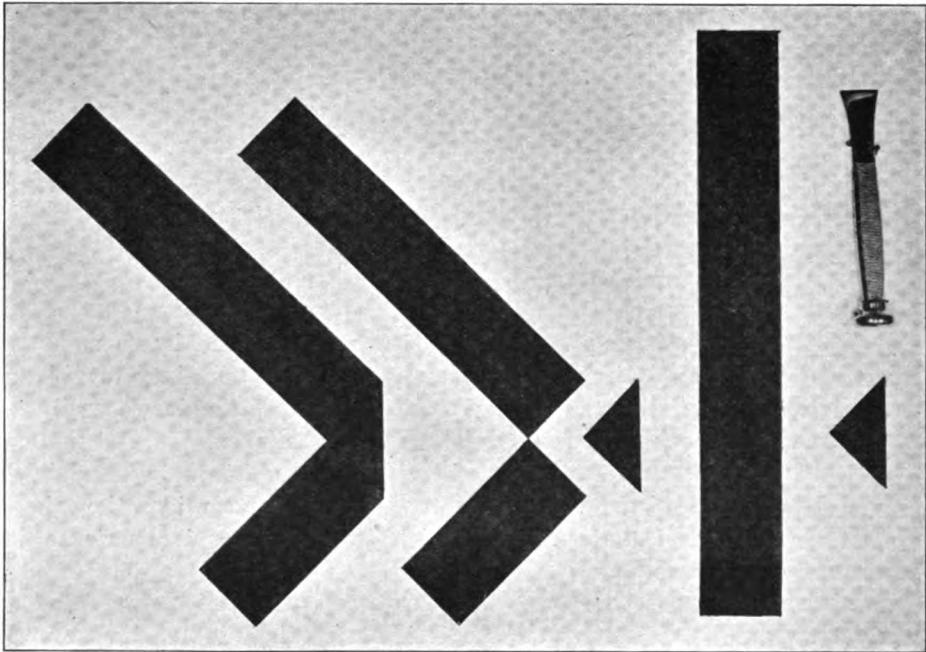


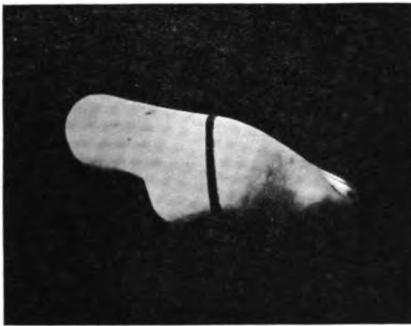
Diagram showing how wedge of bone is removed and foot straightened.

It is claimed for this operation that flat clean surfaces or bone are opposed. There is no cavity to fill up. The wound is a clean cut and there is no bruising or mangling of the surrounding tissues. No sutures except skin sutures are required. If the wedge of bone is sufficiently large and the angles of the wedge are correct, there is no tendency to, or possibility of, a relapse, as every step the patient takes tends to maintain the bone in its new position.

Personally, I use a light retention splint in preference to a plaster cast. Young children will often walk at the end of two weeks.

The dressing is worn from six to eight weeks, when the patient is ready for an ordinary shoe.

The important thing in this operation is to remove the right shaped wedge of bone. The older the patient, the less liability to relapse. When relapses occur they are easily corrected. Paralytic club-foot is more apt to recur than congenital club-foot. I have one paralytic club-foot in a very young child which has once relapsed and has been cured by a secondary operation. The foot is now easily held in perfect position by a simple ankle brace and has every normal motion. The brace could be dispensed with by doing a tendon transplantation but the child is so comfortable as she is and the foot is growing so evenly that I hesitate to disturb present conditions. I believe that if I should discontinue the



Cast of foot of child, showing line of skin incision.

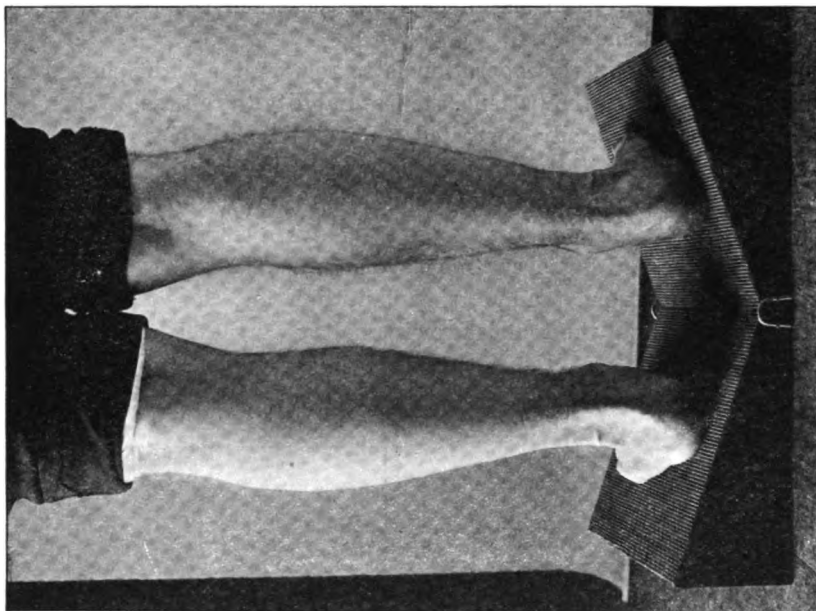


Cast of foot of child, showing line of skin incision.

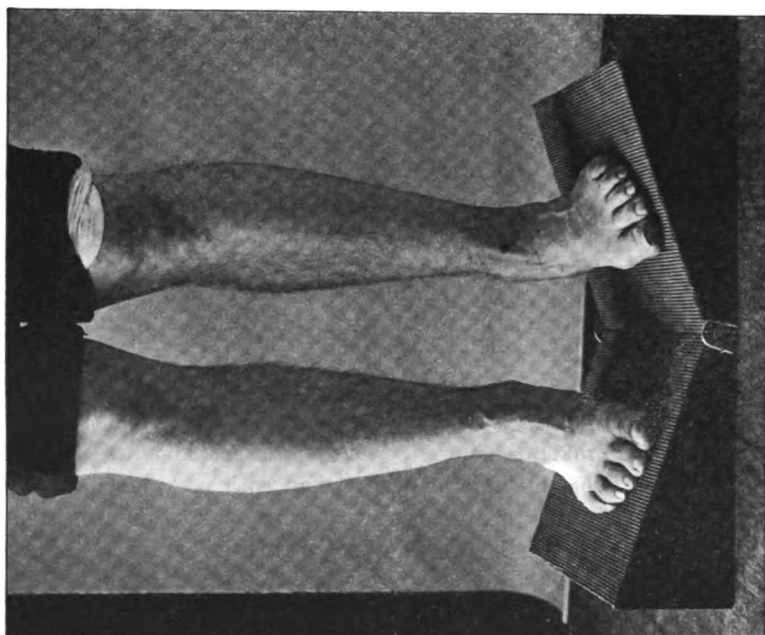
brace and not do a tendon transplantation, this case would ultimately relapse and require a third operation.

In one case, and only one out of thirty, there has been some interference with the growth of the fourth and fifth metatarsal bones of one foot. Whether this was due to the operation described above, why it should occur in one foot and not the other when both feet were operated on, or whether it was due to numerous previous operations of various kinds, I do not know. At all events it does not interfere with the usefulness of the foot.

This operation performed early insures the free, normal use of the foot and the atrophy from disuse is eliminated.

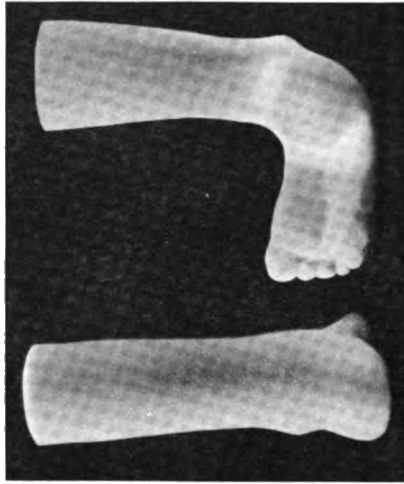


Model standing on incline planes showing elevation of outer border of feet, posterior view.



Model standing on incline planes showing elevation of outer border of feet, anterior view.

A

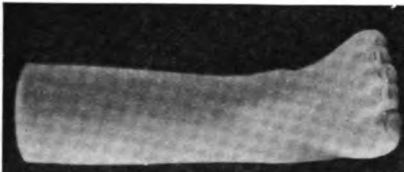


B

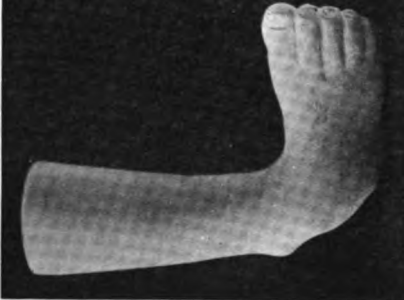


Casts of feet of child, posterior view.  
B was like A before operation.

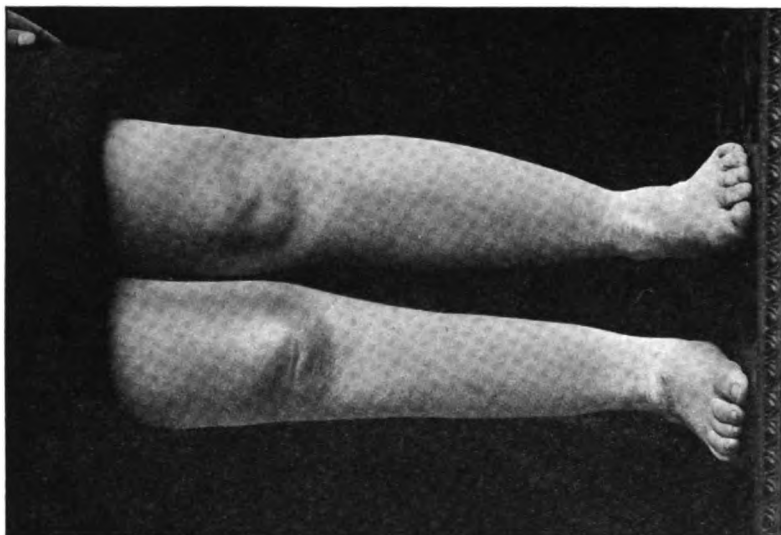
B



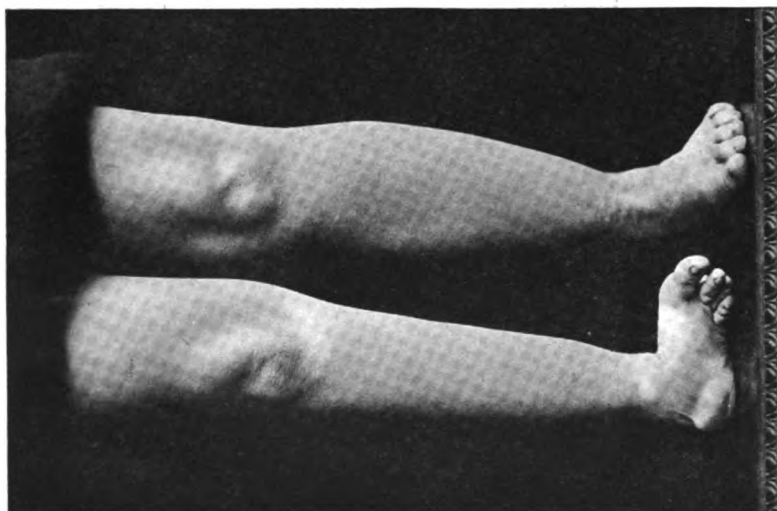
A



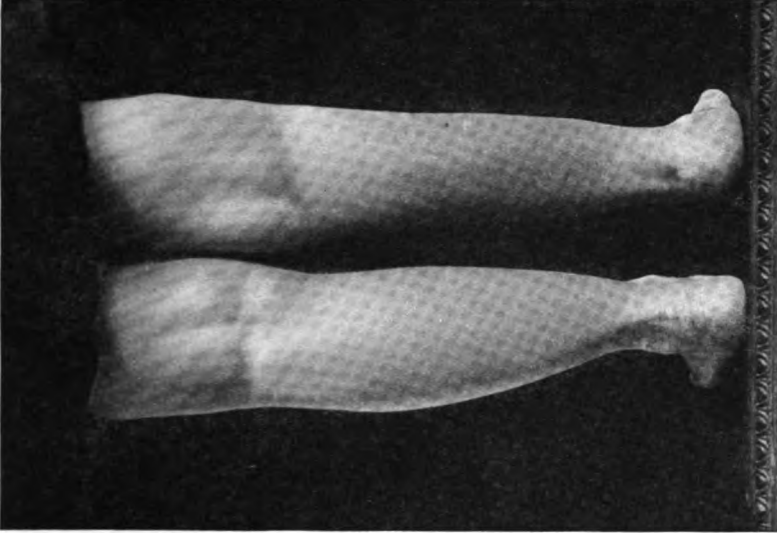
Casts of feet of child, anterior view.  
B was like A before operation.



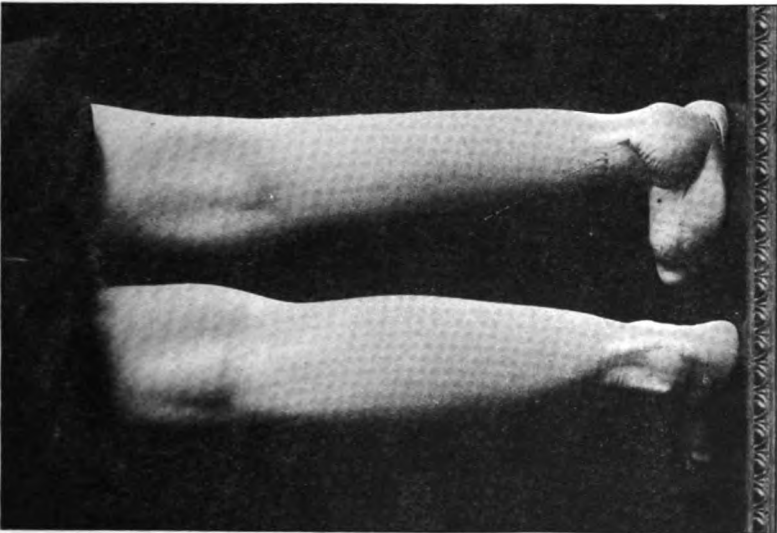
Twenty weeks after operation, anterior view.



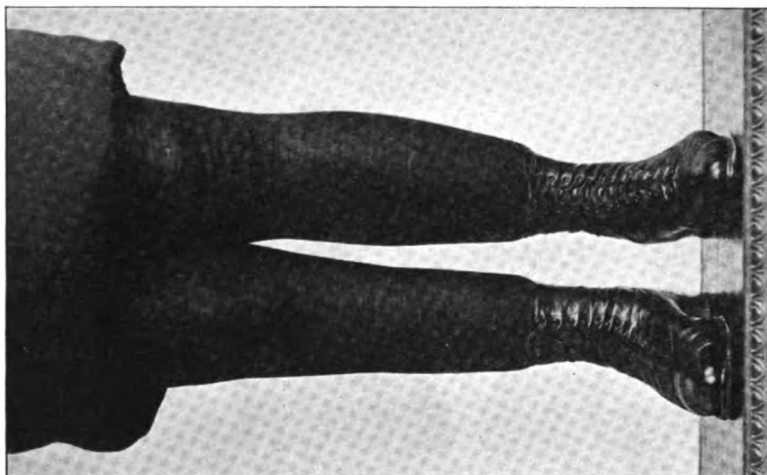
Before operation, anterior view.



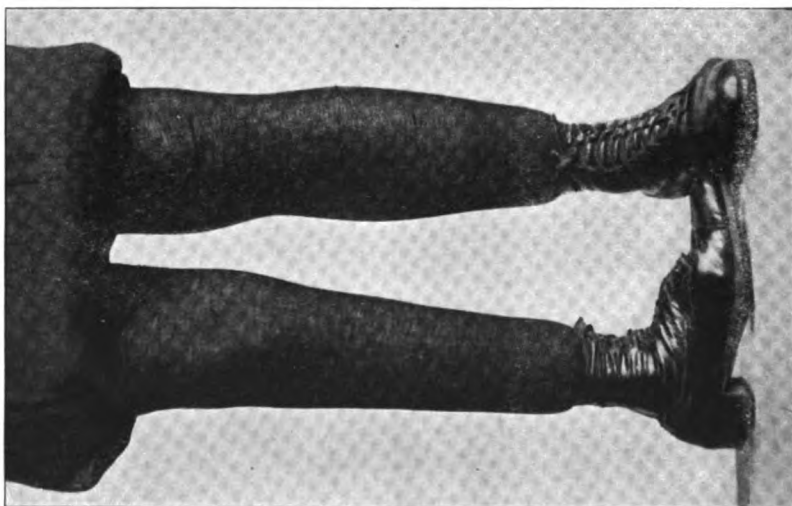
Twenty weeks after operation, posterior view.



Before operation, posterior view.



Twenty weeks after operation.



Before operation.

## END RESULTS.

It is now twenty years since my first tarsectomy. For the last three and a half years I have done the operation for relapsed club-foot exactly as described above. I have operated in all upon thirty patients, in some cases on both feet. There have been no accidents and all of my patients have been perfectly satisfied with the result. Three of the feet have relapsed and I was obliged to do a secondary operation. This, I believe, was because I failed to take out a sufficiently large wedge of bone in the first place. One of the feet had to have a secondary operation because I failed to sufficiently rotate the anterior portion of the foot and a sharp point of bone projected toward the sole of the foot. In one of the feet I took out too large a wedge of bone and the patient now suffers from moderate pronation and flat-foot. All of the patients are cured and all have practically perfect functional use of their feet.

I have two or three patients who are doing well but who, I believe, will ultimately relapse and require a secondary operation. This is easily done by opening the old scar and removing a little more bone. They are young children and their parents had so little trouble with the first operation and are so thoroughly sick and tired of shoes and braces that they are quite ready to let me operate again.



## TENDON FIXATION IN INFANTILE PARALYSIS—A REVIEW OF ONE HUNDRED AND FIFTY OPERATIONS.

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SINCE the presentation of the preliminary report of the method of treatment described under the name of "Tendon Fixation," a sufficient number of patients has been treated in this way and sufficient time has elapsed since the operations, to make a report on the various types of operations performed, the technic employed and the results obtained, of some value.

Reference has already been made to the employment of a similar principle by Tilanus, Sangiorgio and Reiner.

In brief, the method consists of exposing and isolating the tendon, drawing it taut so as to correct the existing deformity, and burying it in the bone in such a way that when healing takes place, the deformity cannot recur (Fig. 1).



FIG. 1.—Diagram illustrating the principle of tendon fixation, the conversion of the tendons of paralyzed muscles into check ligaments.

The method was first applied to some cases of varus and with but few modifications the technic now used is the same as that originally employed (Fig. 2). After the application of a tourniquet a vertical incision is made over the external malleolus, about two and one-half inches in length, exposing the bone and the peronei tendons. The tendons are carefully freed from their sheathes and are either split into several strands by longitudinal incisions or are scarified on their surfaces by numerous small transverse cuts. A longitudinal incision is then made

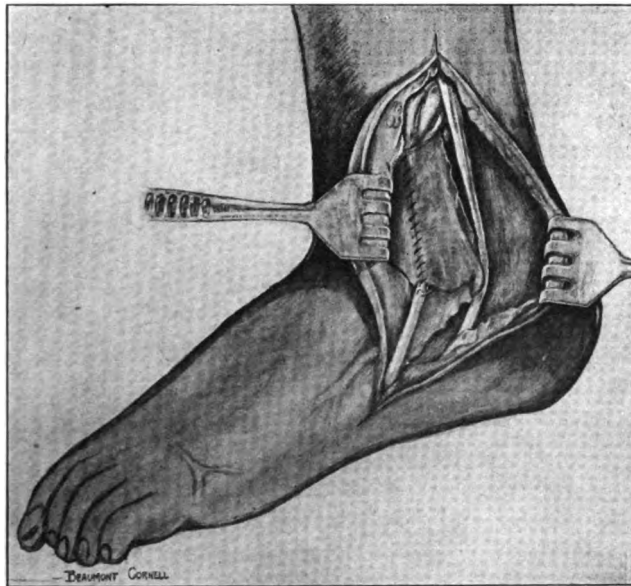


FIG. 2.—Showing fixation of the peronei tendons for paralytic varus. The peroneus longus has been buried and the trough is ready for the reception of the tendon of the peroneus brevis.

through the periosteum on the outer aspect of the external malleolus and shaft of the fibula, extending down past the epiphyseal cartilage to the tip of the bone. With a raspertory the periosteum is raised for about three-sixteenths of an inch on either side of this incision and, if the epiphysis consist of cartilage, a flake of cartilage is raised with a knife to correspond with the reflected periosteum. With a gouge of suitable size and shape a trough is then cut in the bone, the full length of the incision, and of sufficient depth to completely bury one of the

tendons. A similar trough is prepared on the posterior surface of the malleolus subjacent to the groove normally occupied by the tendon. A complete correction is then made of any tendency to varus deformity by manipulation, and the control of the limb is entrusted to an assistant whose duty it is to hold the foot in a slightly overcorrected position. With the aid of a pair of Kocher clamps the tendon of the peroneus-longus is drawn taut and laid in the anterior groove. At the lower end of the incision a medium sized kangaroo suture is passed twice through the tendon and through the cartilage of the epiphysis on either side of the groove and when this suture is tied over the tendon it acts as a very effective anchoring stitch. The periosteum is finally sewn over the buried tendon with cat-gut. This procedure is repeated in the case of the peroneus-brevis. The incision is closed with cat-gut and horse hair and a plaster-of-Paris bandage applied over the dressings to hold the foot in the correct attitude until healing has occurred. The plaster is left on for from six weeks to two months.

A few details are worthy of notice. It is well to bury the peroneus-brevis behind the malleolus rather than in front, because as the chief abductor of the foot it acts much more effectively in this position than in any other. The reason for placing one tendon in front and one behind is to cause the two taut tendons to balance each other and thus prevent the tendency to equinus or calcaneus which would obtain if they were both implanted posteriorly or anteriorly respectively. Again, the surgeon must see that when the suturing of the tendons has been completed, the foot is held by them in an exactly correct position. Any slackness or overtautness in the tendons will persist after the removal of the plaster and result in the recurrence of the deformity or the production of a new one in the reverse direction.

It is well also to remember the scarifying of the tendon. In one case of peroneal paralysis operated on by the above method a complete recurrence of the deformity developed within a week of the removal of the plaster. The operation was repeated a few months later and the tendons were found lying in a tube in the bone through which they slipped quite readily, owing to the fact that their sheathes had been buried with them. In order, therefore, to make sure of a perfectly solid fixation we now thoroughly scrape the tendon and scarify or split it as described above. We have found the use of the single kangaroo tendon suture at the lower end of the incision of great value. In the first place, it is strong and allows of the testing of the attitude in which the taut tendon will hold the foot, without fear of its breaking. In the second place, it shortens the time of operation by reducing the im-

portant part of the suturing to a single stitch. The burying of the tendon under the periosteum can be rapidly completed with a continuous light cat-gut suture without touching the tendon.

This operation of peroneal fixation has been performed a great many times and the results have been very satisfactory. There have been some cases in which the attitude was not quite correct after the removal of the plaster, some being over corrected and some not corrected enough, but careful attention to the details of the technic has much reduced the number of such partial successes.

The four sets of casts which are on exhibition were made on four consecutive patients illustrating different types of paralysis and may, therefore, be taken as representations of the results obtained in the whole series. Illustration No. 3 is a photograph of casts of a case of



FIG. 3.—Photograph of casts of a foot before and after operation. The figure to the right shows the foot in equino varus, resulting from paralysis of the peronei and the dorsiflexors of the foot. The figure to the left shows the same foot some months after fixation of the peronei and the tibialis anticus.

varus made before and after operation. There is no sign of the original deformity and the patient now walks practically without limp.

Several modifications of this technic have been employed. In some cases it has been impossible to get a complete correction of the deformity by simple manipulation. In these cases in addition to the tendon fixation, arthrodesis was performed, sufficient bone being removed from the astragalo-navicular and calcaneo-cuboid joints to allow of easy correction of the varus. The additional support afforded by the arthrodesis is of distinct advantage in the severe cases.



In addition to the prevention of varus in these cases of equino-varus, one of the most gratifying features of the results has been the elimination of the high steppage gait which foot-drop necessitates. The best results are obtained in those patients who have some power in the muscles of the toes and in these the improvement is really very satisfactory.

The method is equally applicable to the condition of paralytic calcaneus (Fig. 4). At first it was feared that it would be too much to expect a fixed tendon to support the whole body weight, but experience has shown that such fears were without foundation. With the patient lying face downward, an incision is made over the tendo Achillis about four inches in length and extending down to the os calcis. The tendon is freed from its sheath and split or scarified as described above. By means of retractors the intermuscular septum covering the deep muscles of the leg is exposed and this is incised with a vertical incision, exposing the muscular bellies of the flexor hallucis longus and the tibialis posticus. These are retracted inward so as to expose the posterior surface of the shaft and lower extremity of the tibia. It may be necessary to detach some of the lower fibres of the former from the bone in order to allow full retraction. The trough is then prepared in the tibia as described above, it being necessary to expose the medullary cavity in order that the tendon may be completely buried. The operation is completed as in the case of the peronei. The tendon is fixed in such a position that dorsiflexion is limited at a slight obtuse angle. This has a double advantage in that it covers the shortening which is nearly always present in calcaneus and it lessens the amount of slack in the tendon, thus adding to the stability of the joint. After solid union has occurred the patient is provided with a moderate lift on the heel of the boot.



FIG. 5.—Photographs of a case of calcaneus, taken before, two months after and one year after operation. The free space under the heel in the second and third figures shows the efficiency of the fixation when the limb is supporting the body weight. The foot and pedestal are cast in one piece.

These cases of calcaneus are the cases which have yielded the most pleasing results. From walking in the awkward, stiff-kneed fashion so characteristic of the deformity, they are restored to a heel and toe gait. Several cases have been treated in whom there is now hardly a trace of limp. These three casts serve to illustrate the results of the operation (Fig. 5). The first was taken before operation and the foot was held in such a position as to show the deformity at its worst. The second was taken a week or so after the patient had begun to walk and is a cast of both the patient's leg and the floor, made in one piece. Part of the body weight is being supported on the ball of the foot and it will be observed that the heel does not touch the ground, indicating the solidity of the fixation of the tendo Achillis. The third was taken nearly a year later and except for the natural growth of the limb, shows the condition to be practically the same as immediately after the operation. This patient has been exhibited to several of the members of the Association and they can corroborate my statement that she walks practically without limp.

It is interesting to note that after the patients have been walking for some time there is marked improvement in the appearance and muscular development of the foot. The cavus diminishes, the muscles of the toes increase in strength, and the ball of the foot and the heel return to a normal appearance.

When paralysis of the tibialis posticus is present in addition to paralysis of the triceps surae, fixation of the tibialis posticus may be combined with the tendo Achillis operation. The tendon is simply drawn taut and buried in a groove in the internal malleolus. About thirty cases have been operated upon in this manner with satisfactory results.

In some of the early operations for calcaneo-valgus the fixation of the tendo Achillis and tibialis posticus were combined with transplantation of the peronei into the os calcis (Nicoladoni). This has been satisfactory in most of the cases, but in several there has developed, after a few months, considerable varus. In order that this may be prevented, the transplantation of the peronei is now omitted and, as far as one can see, without lessening the degree of improvement.

When valgus is present alone or in combination with equinus, similar operations to the above have been performed on the tendons of the tibialis posticus and anticus. When both muscles are paralyzed one of two methods may be employed. In some, the tendon of the tibialis anticus is separated from the muscle and drawn through a hole drilled in an antero-posterior direction through the internal malleolus and fastened to the tibialis posticus tendon as it lies in a groove cut sub-

jacent to the normal position of the tendon. In others, two grooves are cut in the malleolus, widely separated at the lower extremity of the bone, but meeting about an inch and a half higher on its inner surface. The two tendons are at first clamped together and later sutured together over the point of bone formed at the union of the two grooves. The kangaroo and cat-gut sutures are inserted as in the peroneal operation.

The first few operations for valgus and equino-valgus were really experiments, as the writer did not have much hope that the fixations would stand the strain of the whole of the patient's weight which must be supported with each step. But with the additional support of a Whitman flat-foot brace, the results up to date have been quite satisfactory. The three casts exhibited show a typical case of paralytic equino-



FIG. 6.—Photographs of casts of a case of equino-valgus before, two months after and one year after fixation of the tibialis anticus and posticus.

valgus treated in this manner (Fig. 6.) The first cast was taken before operation and shows the marked eversion and abduction of the foot. Naturally, it does not show the toe drop, but the patient walked with a very pronounced limp, of the steppage type, owing to the paralysis of the tibialis anticus. The second cast was made shortly after the operation, and the third nearly a year later. The only criticism to be made is that the correction has been slightly overdone, but the patient walks with only a slight limp and with no sign of the original deformities.

A more recent development of the operation of "Tendon Fixation" was published as a preliminary report in the *Annals of Surgery* of July, 1914. Many patients present themselves for treatment, in whom marked deformities such as varus and calcaneo-valgus exist, but in whom there has been a partial recovery of the paralyzed muscles. Naturally, one does not wish to destroy the surviving muscular function by a complete fixation, and yet the deformity calls for treatment as urgently as in the cases of complete paralysis. To get over the difficulty the experi-





**FIG. 7.**—Illustrating the operation of fixation of half of a tendon in cases of partial paralysis of the muscle. The tendo Achillis in this case has been split and half of it severed from the muscle and buried in the back of the tibia. The sheath has been closed again over the other half of the tendon. The peronei tendons have also been transplanted into the os calcis.

ment was tried of performing a fixation on half the tendon (Fig. 7). The first cases were cases of calcaneo-valgus with partial power still present in the tendo Achillis. The operation is performed as described above, except that by a longitudinal incision the tendo Achillis is split into two halves and one of these is severed from the muscle. The proximal end of this half tendon is then threaded through a small hole in the anterior wall of the sheath, near its insertion into the os calcis and buried in the back of the tibia in the usual way. The sheath is sewn over the remainder of the tendo Achillis with fine cat-gut and the wound is closed.

Similar operations have been performed in cases of varus in which there has been partial recovery of the peronei, half of one of the tendons being buried in the external malleolus.

The results have been most encouraging. In the cases of calcaneus the restoration to normal has been nearly complete, the patient walking with a proper heel and toe gait and with a little spring to the step derived from the muscular power which has been preserved. In fact, this muscular power appears to increase as time goes on, which may be

accounted for by the fact that the muscles are no longer over stretched. The locking of the joint at or about a right angle seems to be quite secure, as none of the cases have shown recurrence of the deformity. It is interesting to note, also, that the half of the tendon still attached to the muscle appears to increase in thickness to about normal size although this has never been corroborated by dissection.

The accompanying casts illustrate such a case of calcaneo-valgus, in which partial power remained in the triceps-surae (Fig. 8). The tibialis



FIG. 8.—Photographs of a case of calcaneus, resulting from partial paralysis of the triceps surae, before, two months after and one year after operation. The operation consisted of lengthening the tendon of the tibialis anticus to let the foot down, and fixation of half of the tendo Achillis in the tibia.

anticus was so contractured that it was necessary to lengthen its tendon about an inch and a half before the foot could be brought down to a right angle. The first cast shows the foot before operation without exaggeration of the deformity. The second cast shows the foot two months after the lengthening of the tendon of the tibialis anticus, the fixation of half of the tendo Achillis and a fixation of the tibialis posticus had been done. The third cast shows the foot as it is now, a year after the operation. It shows the patient supporting the weight on the ball of the foot with the foot at a slight obtuse angle. It also shows very well the increase in muscular development and the restoration of a normal appearance to the fore part of the foot, which follows these operations.

Having clearly demonstrated by this series of operations that tendons can be made to unite very firmly to the bone, that when so united they do not stretch, and that the damage done to the tendon during dissection is not sufficient to cause necrosis, the question of greatest interest to surgeons is that of the permanence of the results. Will the tendon grow at the same rate as the rest of the limb and so avoid a recurrence of the deformity or the production of a deformity in the reverse direction? Will the point of fixation remain in the same place in relation to the other neighboring bony points, or will the bone yield to the strain of the constant pull of the fixed tendon and so change its shape

as to allow recurrence of the deformity? These questions can only be answered by time. Three years have now elapsed since the first twenty operations were performed and up to the present the results have been good. In several cases the feet have nearly doubled in size during this period and still the correct position is maintained. From the success attending this three years' trial we feel hopeful that the results will be permanent.

Several failures or poor results must be recorded. In one case mentioned above the deformity of varus recurred immediately after the patient recommenced to walk, owing to the implantation of the sheath along with the tendon. This is avoided by splitting or scarifying the tendon before its implantation. In several others the operation has resulted in partial correction or over correction of the deformity owing to faulty technic in the fixation of the tendon. It is necessary that the greatest care be taken to see that the deformity is just corrected before the wound is closed and the plaster applied. We have found the single kangaroo anchoring stitch very useful in this relationship. In several other cases of more or less complete danglefoot, various combinations of fixations were performed in the hope of producing a stable foot. This is undoubtedly a mistake, as very little improvement follows and the result in no wise compares with that obtained from astragalectomy as advocated by Whitman. The same may be said of extreme cases of calcaneo-valgus in which, in the writer's experience, no form of treatment is equal to astragalectomy.

On the other hand, in cases of varus, equino-varus, valgus, calcaneus and moderate calcaneo-valgus, marked improvement can be confidently expected. In calcaneo-valgus particularly, the results are brilliant and also in those cases of deformity in which there has been a partial restoration of power in the paralyzed muscles.

Since the introduction of the treatment the application of braces has been confined practically to the first two years after the attack of poliomyelitis, after which "fixation" is performed.

When compared with other forms of operative treatment its advantages are at once apparent. For instance, when compared with arthrodesis, it is theoretically a preferable operation in that it eliminates motion only in the one direction, that of the deformity. Over tendon transplantation it has the advantage of much broader applicability and of much more certain success. It must not be overlooked, however, that in suitable cases it can be combined very profitably with arthrodesis and tendon transplantation. Over silk ligament installation it has the great advantage of securing all that this latter operation aims at obtaining

in a much more direct and efficient manner, both as to the point of the insertion of the new ligament into the foot, the strength of the ligament itself and its upper attachment to the bone. Since the introduction of the operation of fixation of half tendons in cases of partial paralysis, no silk ligaments have been used in our clinic.

The manner in which the tendon unites to the bone at the point of fixation is well shown in a section obtained from the fibula of a case in which fixation of the peronei had been performed a year before. The gross specimen showed the tendon solidly imbedded in the bone although covered only by periosteum. The longitudinal and transverse sections show the fixation of the tendon to be accomplished by short strands of fibrous tissue which pass out of the tendon into the bone. The attachment to the bone is very intimate and this is assisted by the great irregularity of its surface.

Since the publication of the preliminary report on this method of treatment approximately one hundred and fifty operations have been performed at the Children's Hospital. All have healed by primary union and, with the exception of some ten cases, the results have been all that could be hoped for. Of the permanence of the results it is of course impossible to say more at present, but the degree of benefit derived by the patient and the fact that the immediate improvement has stood the test of three years, remove any hesitation on the part of the writer to recommend this form of treatment.

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## A CONTRIBUTION TO THE FATE OF BONE GRAFTS.

BY GEORGE W. HAWLEY, M.D., BRIDGEPORT, CONN.

At the present time tissue transplantation provides one of the most popular fields of surgical enterprise, and the literature which has accumulated on this particular subject during the last few years is formidable. A considerable proportion of this work represents animal experimentation and operation upon man in the transplantation of bone. The result has been to focus unusual interest on surgery of the bones, since it promises to play an important rôle in the progress of surgical therapeutics.

Like all untried ground, bone grafting has brought forth differences of opinion and of interpretation regarding the phenomena which have been observed. There is more or less agreement, however, that there is still much to be learned about bone transplantation. There is much to be learned concerning the fate of grafts, their immediate fate, their remote fate, the fate of grafts in general, and the fate of grafts in different parts of the body.

The purpose of this communication is to describe the fate which befell the grafts in six cases in which a new method of applying the bone graft was attempted. The results observed in these cases are interesting, because the method of using the transplant was similar in principle to other grafting operations, because the site of the operation was particularly advantageous for subsequent observation of the grafts by roentgen ray, and, because the results were nearly all failures.

A little over two years ago the writer endeavored to stabilize the ankle in paralytic deformities of the foot, by the use of a bone graft. The idea was not new, only the mechanical principle employed to lock the joint, and the method of using the transplant according to the approved principles of grafting. This was accomplished by a graft vertically inlaid in a gutter cut in the anterior, or posterior, surfaces of the tibia and astragalus. Technically, this provided ideal conditions for the successful incorporation of the graft, because it brought periosteum to periosteum and endosteum to endosteum. In calcaneo-valgus deformities the graft was placed across the front of the joint in order to check dorsal flexion more effectively. In the equino-varus cases the inlay was done on the posterior surface in order to lock plantar flexion. In most of the cases the lower end of the graft was carried down to, and into, the os calcis. In all of the cases it was possible to mortice the transplants in so tightly, that they could be removed only with difficulty, and required no sutures to hold them in place. Post-operative immobilization in plaster was carried out over a period of from eight to twelve weeks.

Altogether, five cases have been submitted to operation, by the writer, and to this list another case is added, through the courtesy of Dr. H. L. Taylor. Technically, all the six cases were successful. Healing occurred without reaction of any kind. The grafts, to all purposes, took satisfactorily in their new soil, and in all, except two adults, the transplants were kindly received. These two patients complained of pain after the immobilization was discontinued, and the pain was more or less continuous for a long time. The other subjects were children, who suffered no subsequent distress.

The early therapeutic results were excellent, except in the two adults. In both these cases pain interfered with a proper estimate of the function. All the younger subjects had strong, stable joints, with good position and good function.

The excellent opportunity for studying the changes in the transplants by roentgenography was appreciated. In all the cases roentgenographic records were taken at different times, both before and after the plaster was removed. In some instances these examinations were made every few weeks, but no definite rule was followed. The results observed during the first six months were more or less identical. In every case the graft remained secure in its bed without any sign of displacement. At first the line between the recipient bone and the transplant could be clearly seen, but in a short time the bone structure was apparently continuous between the two. In no case did a line of separation persist, or did the graft show any general or eccentric atrophy. In fact, the shadow of the implant was invariably sharper than the native bone, and remained so. The only apparent atrophy was a gradual, even decrease in density, as the graft assumed the texture of the adjoining bone. The only real atrophy was found in the recipient bone along the line of contact with the graft. This was chiefly observed around the lower end of the implant. Evidence of growth in the graft was apparent in most instances. This was particularly noticed in two cases (Cases 5 and 6) where the transplants increased in thickness but not in length. This growth was found greatest opposite the epiphyseal line of the tibia.

After the first six months no systematic roentgenographic records were attempted. It was rather taken for granted that sufficient time had elapsed to determine the permanency of these grafts. If absorption was to occur, it was natural to assume that it would make its appearance early.

In fact, until recently, no records were made except in two cases. In the case of a girl of eighteen (Case 2) roentgenograms were taken at irregular intervals during the year following her operation. This was done in the attempt to discover a reason for the pain which pursued her during that time. This pain was referred to the ankle and was associated with tenderness over the graft at the joint line. No satisfactory explanation of this pain was ever made, but nine months after the operation, atrophy of the graft was observed at the point where it bridged the joint. Where it was imbedded in bone, it was as dense as ever. At subsequent examinations this atrophy was seen to increase, until a year later the dissolution was complete, and with the return of joint motion the pain disappeared.

The other case (Case 4) returned because of recurrence of the deformity. This developed ten months after operation, and the roentgen shadows showed similar changes in the graft, as in the foregoing case,—complete atrophy of the graft opposite the joint.

The results in these two cases led to an investigation of the others. At first it was believed that this peculiar fate of grafts was unusual. It was not expected that this behavior of the graft would be found in nearly all the cases, and it was with no little surprise as each case was examined that almost identical changes were discovered. These later roentgenographic observations, except for the disintegration of the graft at the joint, gave little in the way of new information. There was more evidence of growth in the graft in some. This new bone was chiefly limited to the segment buried in the tibia. The fusion of the graft in the tibia showed a more even blending, and yet its outline could always be made out. No effect of the transplant on the epiphyseal cartilage was apparent, except in one case. This was the only case in which ankylosis had not completely broken down. It is also the case which shows the greatest growth in the graft. In this case the graft bridged two joints and atrophy only occurred opposite one. It is interesting to note that in this case the epiphyseal cartilage of the tibia is wider in front, and narrowed and obliterated behind, where the graft was inserted.

In passing, it may be well to mention the fact that the pain complained of by the adult patients, vanished with the ankylosis.

It is hazardous to attempt interpretation from such a small number of cases, but important questions are naturally raised because the results observed were so uniform.

On what ground can the failure of this method of applying the bone graft be explained? Was the technic at fault? It would hardly seem so, because there was no infection, and no displacement, the anatomic relations were ideal and the contact was good.

Were the grafts too weak to hold the ankylosis and break under the strain? This is doubtful, because the transplants consisted of dense, hard bone, and were so placed that motion at the ankle exerted force in the line of their long axes. Also, the roentgen shadows give evidence of absorption, but not fracture.

Why did those parts of the graft, inlaid in bone, remain vigorous and strong, while only those portions opposite the joint, fade and disappear? Is this an example of the law that function determines, and is more important, than form? Is nature more concerned with the preservation of a paralytic joint than its obliteration? Is replacement acceptable, but substitution resented? This is possible, because in the

older operations for the cure of bone defects the transplants are, as a rule, permanent and capable of remarkable growth.

Does this peculiar fate of grafts occur in other joints? Is it likely to develop in some joints more than others? Do pathologic changes exert any influence on the behavior of transplants? Is the ultimate failure of ankylosis the exception, or more common than generally supposed?

These are leading questions, because the most extensive use to which the bone graft is now put is in the artificial ankylosis of joints. It is the essential feature of the operation for tuberculous disease of the spine, and nearly all writers agree that the bridging of joints is one of the chief indications in the application of bone transplantation. Is it possible that they are wrong, at least in part, and that this unnatural ankylosis tends to be only temporary?

What are the remote results in spinal grafting? Is the ankylosis permanent? If not, what is the average duration of the fixation? Does the partial ankylosis, occasioned by the disease process favor the permanency of the graft?

The treatment of fractures by bone grafting does not properly come under the head of artificial ankylosis, because the fixation is done, not on a natural, but on a false, joint.

In conclusion, it may be said that much may often be learned from failures. The writer is unable to say how much information has been derived from these failures, but the impression has been made that the field of bone transplantation has its limitations.

**CASE 1.** M.D. Aged 19. Out-patient department, Hospital for Ruptured and Crippled. Anterior poliomyelitis when 7 years old. Left equino-varus deformity. Operation by Dr. H. L. Taylor, Jan. 10, 1913. Plaster removed after eighth week, followed by brace for 3 months. Pain for 1 year and 4 months after operation. Roentgenograms: March, 1913, May, 1913, July, 1913, and June, 1914. Recurrence, 1 year and 4 months after operation.

**CASE 2.** M.B. Aged 17. Out-patient department, Hospital for Ruptured and Crippled. Poliomyelitis in fifth year. Left equino-varus deformity. Operation, Jan. 12, 1913. Plaster for 10 weeks, followed by brace for 6 months. Roentgen-ray examination: Jan., 1913, March, 1913, June, 1913, September, 1913, February, 1914, June, 1914, September, 1914. Recurrence, 1 year and 9 months after operation.



CASE 3. G. R. Aged 8. Poliomyelitis at 4 years of age. Right calcaneo-valgus deformity. Operation, Feb. 9, 1913. Plaster for 12 weeks. Roentgenograms: February, March and June, 1913, December, 1914. Recurrence, 10 months after operation.

CASE 4. L. H. Aged 5. Poliomyelitis when 2 years old. Right calcaneo-valgus deformity. Operation, Feb. 20, 1913. Plaster for 12 weeks. Roentgen records: March, April and June, 1913, and December, 1914. Date of recurrence, unknown.

CASE 5. B. L. Aged 6. Poliomyelitis in infancy. Left equino-varus deformity. Operation, April 15, 1913. Plaster for 12 weeks. Roentgenography: April, June and September, 1913; and December, 1914. No recurrence.

CASE 6. F. S. Aged 10. Poliomyelitis when 3 years old. Right calcaneo-valgus deformity. Operation, May 5, 1913. Roentgen examinations: May, June, September and November, 1913, and December, 1914. History of recurrence in July, 1914.

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## CONGENITAL DEFORMITIES OF THE VERTEBRAE AND RIBS. A REPORT OF FOUR CASES.

BY FRED G. HODGSON, M.D., ATLANTA, GA.

SINCE we have been getting better radiographs which show in detail the vertebrae and the ribs, we are finding a great many variations in these structures. A large number of these variations must be considered as congenital or developmental deformities. According to Putti<sup>1</sup> they may be interpreted as due to an arrest in the normal evolution of the embryo. He says a distinction can be made between the following forms:

- A. Numerical variations, concerning the column itself as a whole.
- B. Morphological variations, concerning the individual elements of the vertebral column in their form.
- C. Numerical plus morphological variations, or a combination of the first two mentioned conditions.
- D. Faulty differentiation, concerning not only the metameric, but also the regional differentiation.

### E. Pathological malformations.

Now let us consider these variations in order.

A. NUMERICAL VARIATIONS OF THE COLUMN AS A WHOLE. If one considers the sacrum and coccyx each as one vertebra, the normal column consists of 26 vertebrae. Not infrequently in radiograms we find this number varies, due to faulty segmentation or apparently supernumerary vertebrae. Also we find the number of cervical, thoracic and lumbar vertebrae is not constant, but this will be discussed under (D), or faulty differentiation.

B. MORPHOLOGICAL VARIATIONS. We often find that an adhesion has taken place between the cranial surface of one vertebra and the caudal surface of the vertebra next to it. Then we find vertebrae with only one-half of the body developed; also wedge-shaped vertebrae, and still others merely a rudiment of a vertebra. In some cases the development is so distorted and differentiation so poor that it is impossible to count or locate the vertebrae in their proper places.

C. NUMERICAL PLUS MORPHOLOGICAL VARIATIONS.—This is a combination of the first two mentioned varieties and occurs in nearly all of the cases of severe mal-development.

D. FAULTY DIFFERENTIATION. In the mild cases this is usually limited to the cervico-dorsal, the dorso-lumbar, or the lumbo-sacral regions. Here we find the cervical rib cases, or the first lumbar taking on characteristics of the twelfth dorsal, or vice versa, and also the well-known cases where the fifth lumbar takes upon itself sacral characteristics. This last variety is of especial importance to orthopedic surgeons, and our attention has been called to this point by Goldthwait, Adams, Henderson and others. The more severe cases of faulty differentiation are those cases in which the development is so badly distorted that we can scarcely tell where one region ends and the next region begins.

E. PATHOLOGICAL VARIATIONS The pathological variations, including the cases of spina bifida, rachischisis, anencephalus, etc., will not be taken up in this paper.

With regard to the *costal* element in these cases of congenital deformity of the vertebrae, Putti also calls attention to the fact that a costal anomaly is inseparably connected with a vertebral anomaly. If in any x-ray one discovers a congenital or developmental anomaly in a rib, he may be sure that there is some anomaly in the vertebrae also. This has proven to be true in our cases. The converse of this proposition, however, is not necessarily true, for many cases are found with anomalies of the vertebrae but no anomaly of the ribs.

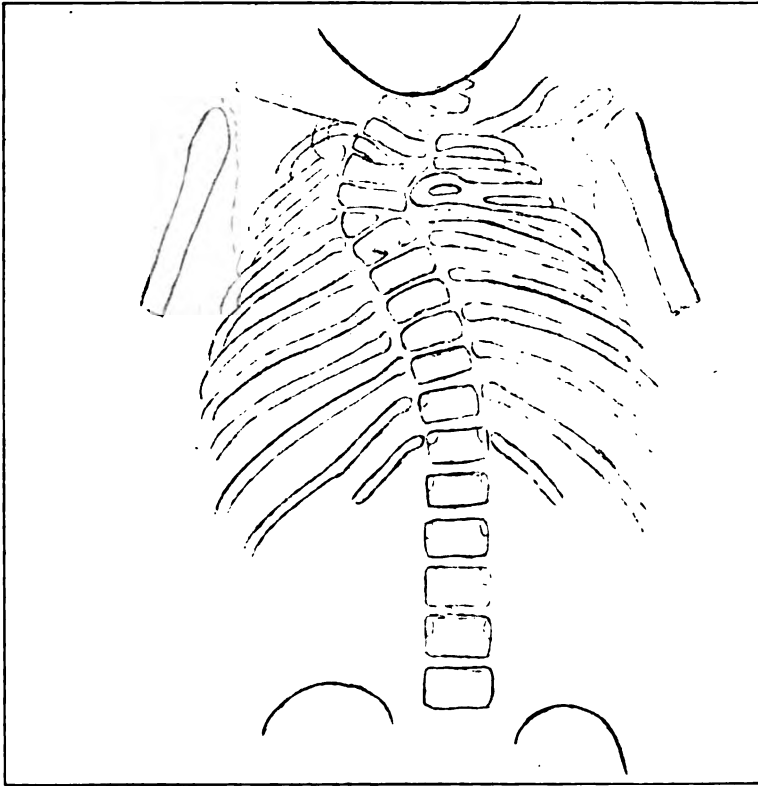
The ribs may show both morphological and numerical variations. Morphologically they may be fused throughout their entire length, or may be separate at both ends and fused in the middle, or they may be fused at both ends and show a separation or oval foramens at or near the middle portion. In regard to numerical variations, in mild cases we find simply one more or one less rib on either one or both sides. One of our cases shows eleven ribs on one side and thirteen on the other. In the severe cases the differentiation is so poor that it is practically impossible to count the individual ribs. Congenital elevation of one or both scapulae is also a condition sometimes found in connection with abnormalities of the vertebrae and ribs.



CASE 1. FIG. 1.



CASE 1. FIG. 2.

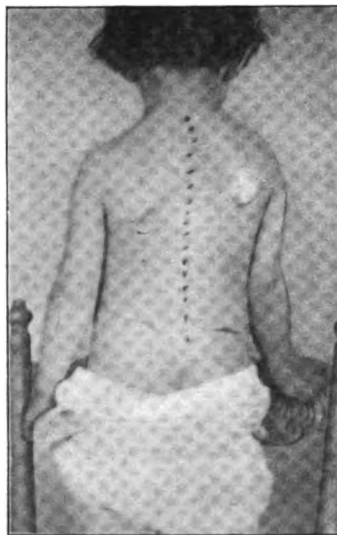


CASE 1. FIG. 3.

CASE 1. G. K., female, age  $3\frac{1}{2}$  years. Mother noticed soon after child began to walk that the upper part of the spine was not straight and the shoulders were of unequal height. See Case 1, Figs. 1 and 2. X-ray taken showed mal-development of seventh cervical to sixth dorsal vertebrae; also fusion of third and fourth ribs on right side. See drawing made from x-ray, Case 1, Fig. 3. Light spinal brace worn and child taught to hold herself in best possible position.

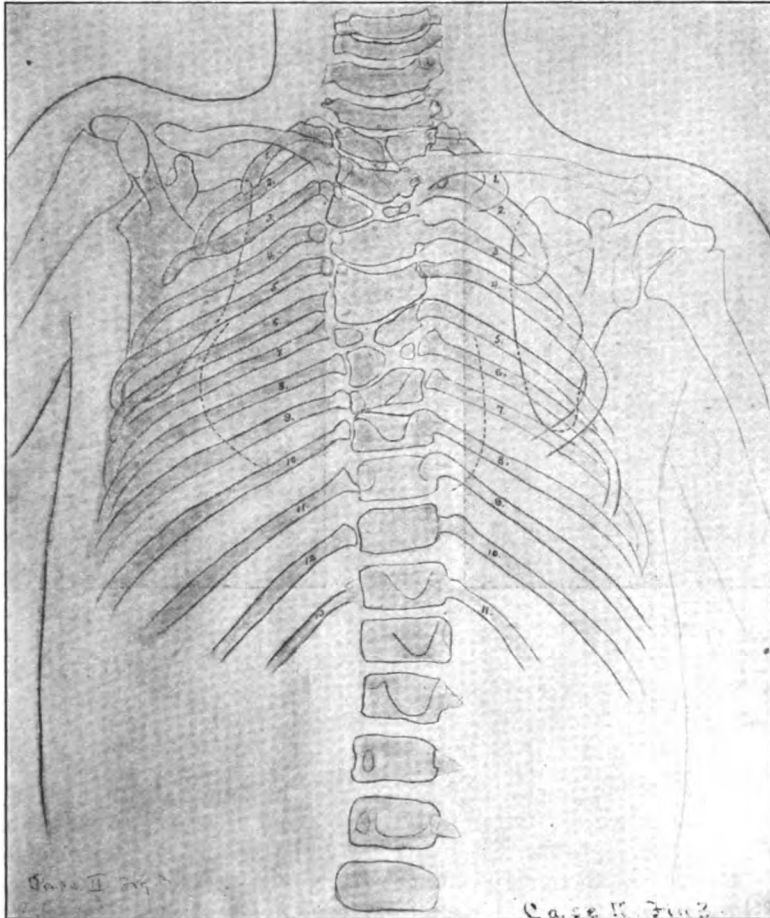


CASE 2. FIG. 1.



CASE 2. FIG. 2.

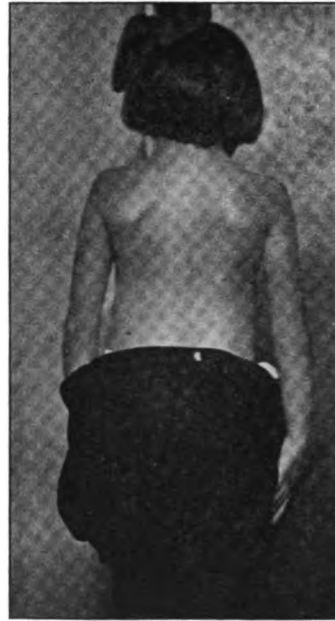
CASE 2. E. E., female, age 4 years. When child began to sit alone at 9 months, mother noticed she did not sit straight. Since she began to walk, and especially following an attack of pneumonia when two years old, the spinal deformity has become more marked. Mother brought the child on advice of her physician to have scoliosis corrected. See photographs, Case 2, Figs. 1 and 2. X-ray showed mal-development of first to tenth dorsal vertebrae; also a numerical variation in the ribs, there being 11 ribs on one side and 13 ribs on the other. See drawing made from x-ray, Case 2, Fig. 3.



CASE. 2. FIG. 3.

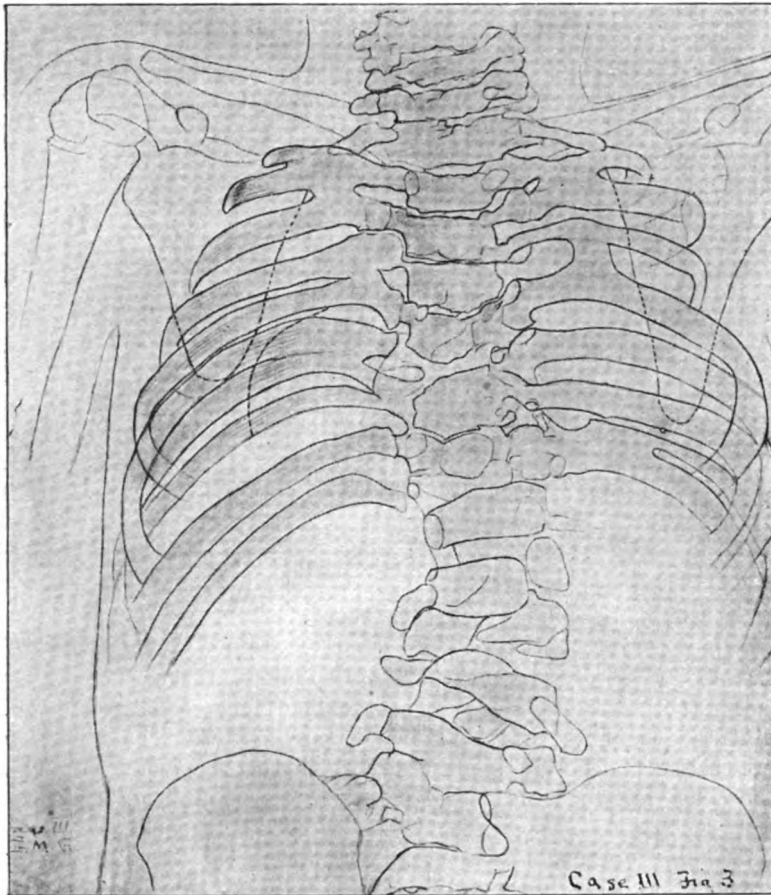


CASE 3. FIG. 1.



CASE 3. FIG. 2.

CASE 3. I. M. G., female, age 5 years. Parents noticed that little girl did not grow as other children of her age. Her physician said she was a dwarf. See photographs, Case 3, Figs. 1 and 2. X-ray taken showed severe mal-development of practically all the vertebrae. Many ribs on both sides show fusion and maldevelopment. See drawing made from x-ray, Case 3, Fig. 3.



CASE 3. FIG. 3.





CASE 4. FIG. 1

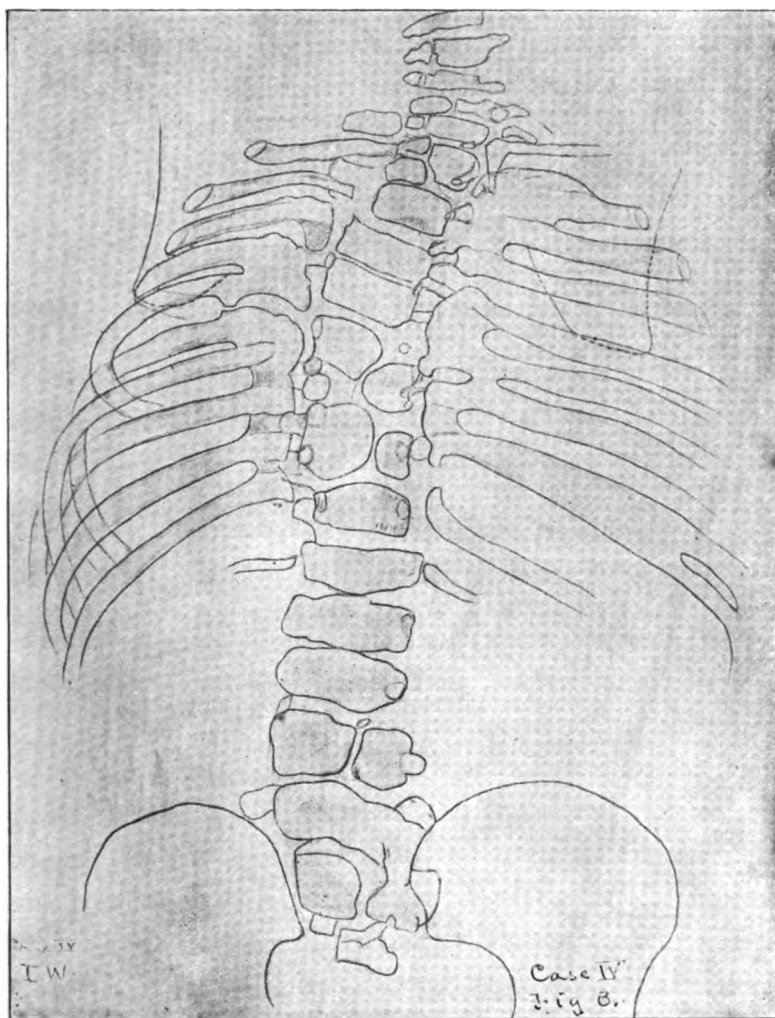


CASE 4. FIG. 2.

CASE 4. I. W., female, age  $4\frac{1}{2}$  years. Sent to us from orphan asylum on account of carrying neck turned to one side. No history could be obtained. See photographs, Case 4, Figs. 1 and 2. The x-ray showed severe case of mal-development of practically all the vertebrae and many of the ribs. See drawing made from x-ray, Case 4, Fig. 3.

There are numerous similar cases reported in the literature, and those interested may consult the references at the end of this article.

**SUMMARY.** The importance of these anomalies to the orthopedic surgeon is very evident. The more severe cases are at once apparent to the naked eye and are often spoken of as "congenital scoliosis." But there are many mild cases, in which the anomalies are not so evident, that are easily overlooked, and it is of importance to be constantly on our guard not to miss any of these. Close study of radiograms of the entire spine will often reveal unsuspected anomalies. May not many of the cases of structural scoliosis, scoliosis sciatica, painful backs, etc., be due to some mild, unsuspected congenital anomaly?



CASE 4. FIG. 3.

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## Editorial

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WITH this issue THE AMERICAN JOURNAL OF ORTHOPEDIC SURGERY makes a decided change in its methods of publication. This journal, which is the only one in the English language devoted entirely to bone and joint surgery, will be published monthly, instead of quarterly. It has been felt for some time that the increasing interest in orthopedic work demanded a journal which would appear more frequently to present adequately the work that is being done.

The various stages of development of THE AMERICAN JOURNAL OF ORTHOPEDIC SURGERY are interesting, corresponding as they do to the growth of the specialty of Orthopedic Surgery. For many years there were published annually the transactions of the American Orthopedic Association, and these volumes represent the work of the members of the Association. To this day these Transactions are intensely interesting and show how much good work was done in the earlier periods. Of course, there was a very definite limitation of field in such a method of presenting papers and the usefulness was confined chiefly to the small body of members, except that a few copies found their way into the comparatively few medical libraries.

The second stage in the growth was marked by the change from the Transactions to THE AMERICAN JOURNAL OF ORTHOPEDIC SURGERY, which appeared four times a year. This was published by a constantly changing editorial board appointed by the American Orthopedic Association, and the result was a journal which had a wider circulation and was more accessible to the medical profession. If we examine the files of the quarterly for the last few years, we can see the evidence of a growth which depended largely on the efforts of a constantly changing editorial board and in reality represented the work of the members of the Association.

With this issue appears the third definite change, the monthly publication and the appointment of a managing editor. We hope that the JOURNAL through this new system will fill a definite need and will represent not only the work of the Orthopedic Association, but also the vast amount of work that is now being done in bone and joint surgery in its widest meaning. The JOURNAL is still the official publication of the American Orthopedic Association, but its scope will be broader and its usefulness will be larger to the general physician and surgeon.

# Orthopedic Society Meetings

CENTRAL STATES' ORTHOPEDIC CLUB. OCT. 11, 1915. AT MINNEAPOLIS, MINN.

*University of Minnesota.*

1. DR. JAMES E. MOORE. Introductory.
2. DR. J. FRANK CORBETT. "Some Changes in Bone."
3. DR. CHARLES A. REED.
  - a. "Tendon Transplantation in a Case of Muscular Dystrophy."
  - b. "Tendon Fixation in Paralytic Equino-Varus."
  - c. "Recent Case of Congenital Club-foot."
  - d. "Non-Union in Fracture of the Forearm Twice Operated."
  - e. "A Folding-Sacral Support."
4. DR. ARTHUR A. LAW. "Autografts in Infected Fields."
5. DR. CHARLES A. ERDMANN. "The Sacro-iliac Joint."
6. DR. JENNINGS C. LITZENBERG. "The Sacro-iliac Joint and Pregnancy."
7. DR. JOSEPH R. KUTH. "Osteochondritis Deformans Juvenilis of the Hip."
8. DR. ROBERT E. FARR.
  - a. "Multiple Enchondroma of Bones."
  - b. "Pneumatic Injector and the Use of Local Anesthesia in Sarcoma of Lower End of Ulna (Excision Transplant), Double Transplant (Dowell) in Non-Union of Radius and Ulna, Colles' Fractures, Fracture of Radius and Ulna, Loose Bodies in the Knee Joint, Chronic Bone Abscess of Lower End of Femur, and Chronic Bone Abscess of Tibia."
9. DR. JULIUS P. SEDGWICK.
  - a. "Lordotic Albuminuria."
  - b. "Muscular Dystrophy in Childhood."
10. DR. ARCHA WILCOX.
  - a. "Fracture Bed."
  - b. "Two Fracture Cases: One Compound Fracture, Tibia and Fibula; One Simple Fracture, Thigh (Intramedullary Splint)."
11. DR. HENRY ULRICH. "Blind Dental Abscess and Pyorrhea in Relation to Chronic Arthritis Processes."
12. DR. EMIL S. GEIST.
  - a. "Coxa Vara in Old Reduced Congenital Dislocation of the Hip."
  - b. "Celluloid Weak Foot Braces."
  - c. "Multiple Exostosis."
  - d. "Tuberculous Spines."
  - e. "Fractures and Epiphyseal Separations."
  - f. "Jones' Method in Ischaemic Contracture."
  - g. "Silk Quadriceps Tendon."
  - h. "Chronic Multiple Arthritis."
  - i. "Chondrodystrophia Foetalis."
  - j. "Disturbances of the Accessory Scaphoid."
  - k. "Unusual Congenital Foot Deformity (Specimen)."
  - l. "X-rays and Lantern Slides."

*Morning, October 13, 1915. Rochester, Minn. Mayo Clinic.*

Operations by DR. M. S. HENDERSON.

- "Transplantation Tendon. Ext. Prop. Hallucis to Head First Metatarsal."
- "Albee Operation. Tuberculous Lumbar Spine."
- "Bone Transplantation, Fracture Left Tibia. Non-Union."
- "Loose Bodies, Left Knee."
- "Lengthening Left Tendo Achillis. Tendon Transplantation, Right Foot."
- "Resection, Right Knee (Tuberculosis)."
- "Double Bunions. Mayo Operation."
- "Explore Right Psoas Abscess."

*Afternoon, October 13, 1915.*

- "Radiographic Demonstration of Complications, Pulmonary, Etc., of Bone and Joint Conditions." Dr. A. B. Moore.
- "Two Cases of Von Recklinghausen's Cystic Degeneration of Bone, Histories, X-Ray Findings, Etc." Dr. H. W. Meyerding.
- "Treatment of Un-united Fractures of the Neck of the Femur, X-Ray Slides." Dr. M. S. Henderson.
- "Infectious Arthritis (Bacteriological Study)." Dr. A. C. Rosenow.
- "The Tonsils and Arthritis." Dr. Justus Matthews.
- "Mouth Infections As a Focus for Infectious Arthritis." Dr. G. B. New.
- "Neurological Findings in an Obscure Case of Tuberculosis of the Spine." Dr. W. Sheldon.
- "Loose Bodies in the Knee Joint (Lantern Slides)." Dr. M. S. Henderson.

Presentation of Orthopedic Cases, Drs. Henderson and Meyerding.

- "Arthroplasty Hip Joint."
- "Bone Transplantation, Fracture Tibia (Two Cases)."
- "Syphilis Elbow Joint."
- "Talipes Equino Varus."
- "Tuberculosis Spine. Albee Operation (Two Cases)."
- "Arthroplasty Elbow Joint."
- "Osteomyelitic Tibia with Three and One-half Inch Lengthening."
- "Double Congenital Dislocation Hips (Reduced)."
- "Tuberculosis Acetabulum, Right Hip, Unusual Deformity."
- "Resection Knee Joint for Tuberculosis."

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#### THE INTERURBAN ORTHOPEDIC CLUB AT BOSTON.

*Morning of December 30, 1915.*

#### MASSACHUSETTS GENERAL HOSPITAL. ORTHOPEDIC DEPARTMENT.

- 8.30 to 9.00. Visit Ward I. Dr. Mark Rogers.
- 9.00 to 10.00. Operating Room, Ward I. Dr. E. G. Brackett.
- 10.00 to 11.40. Lower Out-Patient Amphitheatre. "Scoliosis," Dr. M. S. Danforth; "Orthopedic Failures," Dr. R. B. Osgood; "Club Feet," Dr. C. L. Hall; "Stoeffel's Operation," Dr. C. H. Bucholz.

#### PETER BENT BRIGHAM HOSPITAL.

- 12.00 M. "Surgical Technic," Dr. Harvey Cushing.

#### HARVARD MEDICAL SCHOOL LIBRARY.

- 1.00 P.M. Luncheon. Amphitheatre, Building A.

*Afternoon of December 30, 1915.*

- 2.00 to 2.20. "The effect of Ether Anesthesia on Afferent Nerve Impulses in the Brain," Dr. Alexander Forbes.  
 2.20 to 2.40. "The Uric Acid Content of Blood," Dr. Otto Folin.  
 2.40 to 3.00. "Osteomyelitis," Dr. E. H. Nichols.  
 3.00 to 3.20. "Methods of Teaching the Technic of Fixation of Bones and Joints." Discussion.  
 3.20 to 3.40. "Regeneration of Bone," Dr. F. J. Cotton.  
 3.40 to 4.00. "Orthopedic Significance of the Twelfth Rib," Dr. Joel E. Goldthwait.  
 4.00 to 4.30. "Serbia," Dr. Richard P. Strong.

## COLLIS P. HUNTINGTON HOSPITAL OF CANCER RESEARCH.

- 4.40 to 5.00. "Effect of Radium Upon Bone Cancer," Dr. William Duane.  
 5.00 to 5.30. "Fixation of Gun-Shot Wounds," Dr. Robert B. Greenough.

## HARVARD MEDICAL SCHOOL

*Administration Building, Room 110, Adjoining Library.*

- 5.40. Executive Session.

## HARVARD CLUB, 374 COMMONWEALTH AVENUE.

- 7.00. Club Dinner.

*Friday, December 31, 1915. Operations.*

## CHILDREN'S HOSPITAL.

- 8.30 to 9.30. "Clubfoot," Dr. Ober; "Congenital Hip, — Spastic Paralysis," Dr. Lovett; "Fasciotomy," Dr. Soutter.  
 9.30. "Muscle Tests in Poliomyelitis," Dr. Martin.  
 9.50. "Poliomyelitis," Dr. Lovett.  
 10.20. "Pectoral Transplantation," Dr. Legg.  
 10.30. "Multiple Exostoses," Dr. Ehrenfried.  
 10.50. To be announced. Dr. Fitzsimmons.  
 11.00. "Volkman's Paralysis," Dr. Sever.  
 11.10. "Cases of Muscle Transplantation, Astragalectomy, and Congenital Hip," Dr. Soutter.  
 11.40. "Flattened Heads of the Femur," Dr. Legg.  
 12.00. "Recent Research in Human and Bovine Tuberculosis," Dr. Wallace.  
 12.20. "Obstetrical Paralysis," Dr. Sever.  
 12.40. "Bone Syphilis with X-Ray Interpretation," Dr. Post and Dr. Brown.  
 1.10. Lunch at the Hospital as guests of the Children's Hospital Trustees.

*Afternoon of December 31, 1915.*

## ROBERT BRIGHAM HOSPITAL.

- 2.00 to 2.15. "The Relation to the Community of a Chronic Hospital," Dr. J. E. Goldthwait.  
 2.15 to 2.25. "To What Extent Are the Causes of Chronic Arthritis Demonstrable in the Experience of This Clinic?" Dr. C. F. Painter.  
 2.25 to 2.45. "Fluoroscopic Demonstration of Visceroptosis." X-rays to illustrate this in Arthritic Cases. Dr. Morrison.  
 2.45 to 3.10. "The Postural Treatment of Arthritis," Dr. L. Brown.

- 3.15 to 3.40. "What Is the Rational Basis for Classification of Chronic Arthritis? A Demonstration." Dr. C. F. Painter.
- 3.50 to 4.15. "The Work of the Research Laboratory in a Hospital for Chronic Disease," Dr. F. H. McCrudden.
- 4.15 to 4.30. "The Influence of the Ductless Glands and the Sympathetic Nervous System on the Arthritis Problem," Dr. John Bryant.
- 4.30 to 4.50. "The Part Played by Physical Therapy in the Management of Chronic Cases." A Demonstration. Dr. Brown and Mrs. Oreon.
- 4.50 to 5.15. "The Importance of Manual Training in the Treatment of Chronic Disease." A Demonstration.
- 5.15 to 5.35. "The Treatment of Certain Aspects of Syphilis of the Central Nervous System." Dr. George Clymer.
- 5.35 to 6.00. "The Therapeutic Value of the Dental Service to a Chronic Hospital." A Demonstration. Dr. Thoma and Dr. Ware.

## Book Reviews

*Orthopädische Behandlung Kriegsverwundeter.* By HANS SPITZY AND ALEXANDER HARTWICH. Berlin and Vienna: Urban & Schwarzenberg. 1915.

The little book of Spitzzy and Hartwich has been written chiefly as a guide and adviser of those surgeons who have to take care of wounded soldiers without having had special orthopædic training. It has arisen from a large experience in the orthopædic military hospital and in the school for invalids in Vienna.

In the first chapter of part one certain frequent orthopædic conditions of non-wounded soldiers are discussed, such as flat-foot, metatarsalgia, swelling of the foot, distortions which so frequently prevent a soldier from doing his strenuous work. The therapeutic suggestions are simple, allowing easy applications under the most unfavorable conditions; as e.g., strapping with adhesive plaster, and support by cotton wadding and plaster and such like.

In the second chapter instructions in the correct application of simple splints and plaster-of-Paris casts in the field hospitals are given for various parts of the body, and notes are added as to how certain injuries of soft tissues and nerves are best taken care of in the field.

The second and much larger part is divided into a general and a special part. In the general part operations are discussed: in the soft tissues, scars, on the bones, osteotomy for fractures healed with deformities, callus, pseudo-arthroses, and on the nerves, neurolysis, suture and plastic. This last chapter is of particular value being written by a surgeon who has enriched our knowledge in this line of surgery so much. Furthermore, the physical therapeutics, the technic of plaster-of-Paris casts under the more favorable conditions in the home hospital and the technic of orthopædic apparatus is amply discussed.

In the special part, all regions of the motor system are considered. Another part instructs in the making and fitting of the prostheses for amputated legs, arms, hands and fingers, with advice as to the best possible care of the stumps.



The last part is devoted to a presentation of the schools for invalids which have such a rich field in the present gigantic struggle.

The general tendency of the authors is to show how much can be done with very simple means and that in most cases the orthopædic treatment should not attempt too much, but only strive to fit the wounded soldier for some useful occupation.

While this well-illustrated book is written for those who have had insufficient orthopædic training, and the authors emphasize that the number of such surgeons is larger than we could wish for or expect, every orthopædic surgeon will read it with great benefit and will enjoy the many rational and valuable suggestions given herein.—C. H. BUCHOLZ.

*Injuries to Joints.* By MAJOR ROBERT JONES, R. A. M. C. (T.). London: Henry Frowde, and Hodder and Stoughton. 1915.

This little book, offering as it does not only the concentrated experience of the present war, but an accumulated experience perhaps wider than that of any living orthopedic surgeon, is of the utmost value.

A great mind which grasps at once the mechanical essentials has chosen to reduce these to their simplest forms and to formulate rules that have so few exceptions that they may be considered almost axiomatic. They have the rare quality also of being easy to retain in the mind.

The clear description of the pathology of the lesions and the essential histology of the repair processes makes evident the sound basis on which the treatment advised is based. Everyone who reads this book carefully must be better equipped to relieve the symptoms and to obtain good functional results in the important class of injuries with which it deals. The author leaves no doubt as to his own opinion nor of the reasons which have led him to hold these convictions. His appreciation of the mental attitude of the patient is most keen. He emphasizes the fact and points it by illustration that the confidence of the patient must be obtained in order to secure his all-important coöperation.

The style is clear and concise and the text is well illustrated with original photographs of methods and apparatus as well as line drawings of lesions. The chapter headings give a good idea of the scope of the book:

- I. General Outline of Principles.
- II. Bandaging, Massage, Movement.
- III. Pain and Stiffness in Relation to Diagnosis and Treatment.
- IV. Stiffness and Limitation of Movement.
- V. Contraction of Scar Tissue.
- VI. Joints of the Upper Limb.
- VII. Injuries to Spinal Column.
- VIII. Joints of the Lower Limb.
- IX. Ankle-Joint and Foot.

It would be hard indeed to recommend too highly this War Primer. It will be valuable to the orthopedic as well as the general surgeon. It will be used in peace as well as in war.—ROBERT B. OSGOOD.

## Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.

### I. TUBERCULOSIS OF BONES, JOINTS AND TENDONS.

**TUBERCULIN IN SURGICAL TUBERCULOSIS WITH SPECIAL REFERENCE TO THE USE OF SENSITIZED BACILLARY EMULSION.** By A. G. Burnham. *Journal A. M. A.*, July 10, 1915, p. 146.

The use of the sensitized bacillary emulsion of tubercle bacilli is described and a table of its application to dispensary cases of surgical tuberculosis given. The results are not encouraging.—*Edward S. Hatch, New Orleans.*

**ASTRAGALECTOMY FOR TUBERCULOSIS OF THE TARSUS.** By Leonard W. Ely. *California State Journal of Medicine*, July, 1915.

Author reports a case of proven tuberculosis of the posterior talo-calcaneal joint in the adult, where astragalectomy and destruction of the joint were done according to Whitman's method.

Seventeen months later patient had no signs of active disease and could walk many miles. (Foot showed 20° motion).

Mechanism of cure he feels is not by fixation but change of the affected marrow from lymphoid to fatty type, as a result of the joint destruction. This, he maintains, is true of all resection cures.

He advises destruction of the joint in all adult joint tuberculosis.—*Walter Baldwin, San Francisco.*

**TREATMENT OF THE TUBERCULOUS INTRACAPSULAR FOCUS IN NECK OF THE FEMUR.** W. Keppler and F. Erkes. *Archiv. f. klin. Chir.*, LV, No. 3, September 15, 1914.

Based on a study of the literature, as well as on their own observations, the authors believe that operative treatment in cases of circumscribed tuberculous foci in the neck of the femur deserves wider application, especially in view of the fact that 25% of the tuberculous hip lesions are supposed to be primary in the neck. The method is considered applicable, even in cases in which there is perforation into the joint with early synovial involvement.

The advantages of operative treatment are a shorter period of convalescence with prevention of joint involvement. In cases where there is both osseous and synovial involvement, operative treatment will eliminate the osseous

lesion, transforming the condition into a purely synovial form. In cases where the lesion lies close to the trochanter, as well as in those in which there are abscesses or fistulae in the region of the trochanter, it is best to approach the focus by tunneling the neck through the trochanter. When the lesion occupies the proximal and inferior portion of the neck, and in all cases in which the joint is already involved or in which abscesses or fistulae occur anteriorly, the Luecke-Schede approach is indicated. They believe that opening the joint is not nearly so dangerous as commonly supposed, provided asepsis and bleeding are carefully controlled. Closure of the wound in layers without drainage is essential.—*F. J. Gaenslen, Milwaukee.*

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RESECTION OF THE TUBERCULOUS HIP-JOINT. Riedel. *Archiv. f. klin. Chir.*, CV, No. 3, September 15, 1915.

In 1893 Riedel reported 88 operative cases, 79 resections, 4 erosions and 5 exarticulations. Seventy per cent. of these showed sequestrae. Of the 124 cases operated between 1893 and 1910, 47% had sequestrae. Conservative treatment should first be given a thorough trial. The primarily synovial cases respond most readily, the osseous without sequestrae heal with more difficulty, while the osseous cases with sequestrae probably never heal with conservative treatment.

Riedel believes that in preference to resection, which is always mutilating, removal of the sequestrum, extirpation of the capsule, and reposition of the head should be tried in selected cases. The advantages are: (1) The acetabulum is filled with bone rather than with diseased fibrous tissue which predisposes to relapse, and (2) There is much less disturbance of growth.

Langenbeck's vertical incision is used, combined with an anterior transverse extension. The capsule is extirpated, the head is dislocated. Sequestrae and diseased areas of acetabulum and head are removed and the head replaced. Sixteen case histories are given. The results are considered much superior to those following resection.—*F. J. Gaenslen, Milwaukee.*

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CONSIDERATION OF RELATIVE MERITS OF ALBEE OPERATION AND HIBBS OPERATION. E. H. Smith. *California State Jour. of Med.*, May, 1915.

In a paper which does not easily lend itself to short summarization, the writer discusses the relative merits of the Albee bone graft and the Hibbs osteoplastic operation for tuberculous spinal disease. He endorses the work of Lovett and Thorndike of Boston, stating that the Albee operation is not advisable in children under five years. The objection offered is that the tibial graft will bend, allowing the kyphosis to increase. The Hibbs operation, on the other hand, he believes productive of a "soft callus" which by its great volume alone will support the spine better than tibial cortex. No series of cases from personal experience is quoted, however, to support these arguments. He believes the older the patient up to adult life, the more applicable the Albee operation, while the Hibbs should not be performed on children after the fifteenth year, believing that the callus produced by the osteoplastic operation is very slight indeed and, moreover, does not control the immediate pain as efficiently as the bone graft. He makes a special point of the efficiency of the bone graft in cases of lateral angulation, planting the graft on the side of the concavity well down on the laminae, and fixing it there by sutures. The technic of his tibial bone graft operation seems to differ very markedly from that of Dr. Albee.—*Walter Baldwin, San Francisco.*

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

PREVENTION AND TREATMENT OF THE DEFORMITIES IN ANTERIOR POLIOMYELITIS. By Jacob Grossman, *Medical Record*, July 24, 1915.

The author gives a very complete résumé of the treatment of deformities likely to follow the paralyzes of anterior poliomyelitis. He mentions the use of massage, hydrotherapy and static electricity during convalescence after soreness has disappeared, and calls attention to the necessity of preventive measures against deformity to be employed immediately after a diagnosis has been made. After a year or two spent in muscle training, massage, splints or braces, he advises operative measures in the way of tendon lengthening and transplanting, arthrodeses, osteotomies and other well known procedures, if they are needed for further improvement in the stability of limbs. The paper is to be especially commended for its completeness and conciseness.—*H. A. Pingree, Portland, Maine.*

LEPROSY OR SYRINGOMYELIA. G. B. Hassin, Gordon Burke and John Nuzum, *Journal A. M. A.*, July 17, 1915, p. 235.

This case is very carefully considered and the weight of evidence seems to favor leprosy. The reviewer has had several cases apply for treatment at his clinic in the last few years with indefinite pains and weakness in the arms and legs which were later diagnosed by the neurologist as leprosy.—*Edward S. Hatch, New Orleans.*

CASES ILLUSTRATING ORTHOPEDIC TREATMENT OF SOME OF THE DISABILITIES RESULTING FROM INFANTILE PARALYSIS. By Michael Hoke and Fred G. Hodgson. *Southern Med. Jour.*, September, 1915.

The following guides are given in the treatment of these paralytic cases.

1. The minimal use or entire removal of braces or other apparatus.
2. Tendon transplantation or silk ligaments used in connection with balancing the skeleton.
3. Operations should be done upon the skeleton which will enable the skeleton to take the weight load in a way to remove the tendency to relapse after the deformities have been corrected.
4. Accurate operations remove the necessity for braces in most cases. However, braces have their periods of usefulness.
5. Prolonged post-operative massage and muscle training by an expert is stressed.

Cases illustrating results obtained were shown by means of moving pictures.—*F. G. Hodgson, Atlanta.*

SUBPERITONEAL NEUROTOMY OF THE OBTURATOR NERVE. M. Leriche. *Revue de Chirurgie*, XXXIV, No. 7.

M. Leriche emphasizes the real merits of the operation in case of irreducible contractions of the adductor muscles of the thigh. The case reported by M. Leriche was that of a young man of twenty years suffering from a spastic infantile paralysis. Through Pfannensteil's incision, and following the subperitoneal route, the left obturator nerve was reached and resected. A similar *modus operandi*, however, on the right side was not equally successful. The patient was but slightly relieved. Regarding this class of cases it is well to remember that, on account of the extreme contraction of muscles and ten-

done, the choice of this operation offers very little hope to the afflicted adult. The subperitoneal route, at its best, is rather difficult, and it is for this reason that M. Leriche prefers the "transperitoneal method" for this latter class of cases.—W. L. LaMarche, Cambridge, Mass.

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THE TREATMENT OF INFANTILE PARALYSIS: PRELIMINARY REPORT, BASED ON A STUDY OF THE VERMONT EPIDEMIC OF 1914. By R. W. Lovett. *Bulletin of Med. and Chir. Faculty of Maryland.* June, 1915.

Dr. Lovett was asked by the State Board of Health of Vermont to treat the cases of infantile paralysis occurring in the summer of 1914, which numbered 293. He examined all of the cases personally, and found after deducting all in which paralysis was due to other causes, that the number was reduced to 149, and it is from this number that the conclusions presented are drawn.

The age of onset varied from six weeks to forty-one years, a large percentage of cases occurring after ten years. It is also noticed that the death rate was 17%, showing the severity of the infection. An attempt was made to see if any relation existed between the severity of the attack and the degree of the paralysis; no conclusions were drawn as the parents were always inclined to regard the attack as serious. The muscles were individually tested as to function and were classed:

1. Wholly paralyzed.
2. Partly Paralyzed.
3. Normal.

The cases under analysis were seen from two to six months after the onset of the disease. Of 1452 muscles affected, 416 were totally paralyzed, and 1036 only partly. A curious phenomenon is reported where part of a muscle was paralyzed and the other part not affected.

The predominance of partial paralysis Dr. Lovett considers due to the grouping and relation of nerve cells in the anterior cornua of the cord.

He gives a number of tables showing the occurrence of paralysis in the individual muscles, and the association of certain groups of muscles. The study of this localization he hopes may lead to some more successful means of treatment.

The subject of associated paralyses is of interest and should be of great value in determining therapeutic measures. Three explanations are given of predominance of associated paralyses.

1. The centers of the large muscles are large and composed of many motor cells, especially those maintaining the erect position.
2. Centers of associated muscles may be so intimately grouped that the disease easily spreads from one to another.
3. The association of function of groups of muscles so intimately connected as to interfere with one another.

He thinks that the true explanation is rather in a combination of all of these ideas rather than one.

In the matter of treatment, he advocates rest, until all tenderness has disappeared (the tenderness, he thinks, might last from two to three months), apparatus, to prevent deformities, and muscle training and massage to be started as soon as the tenderness has subsided.

The question of deformity has as yet hardly arisen, as the cases are of short duration, and he believes should be taken up in the routine way.

It is to be hoped that Dr. Lovett may be able to bring his investigations to a successful conclusion and thus throw more light on this interesting subject.  
—*John Dunlop, Washington, D. C.*

NECESSITY FOR ORTHOPEDIC TRAINING IN HEMIPLEGIA. By L. Mayer. *Berlin klin. Wochenschrift*, June 7, 1915. Abstr. in *Jour. A. M. A.*, July 24, 1915.

Many hemiplegias develop more or less severe deformities which may be prevented or relieved by orthopedic treatment. Such means of treatment are too often neglected by the physician or the neurologist in charge of the case.

Foot drop with contracture of the tendo Achillis, and pronation of the arm with flexure deformity of the wrist and fingers are deformities frequently encountered in these cases of hemiplegia. The use of splints to maintain the arm and the foot in proper position following a stroke of paralysis will prevent such crippling deformities, and the employment of spring splints will, in many cases, correct the faulty positions and improve the gait of the patient.—*A. Bruce Gill, Philadelphia.*

JOINT TROUBLES ARISING FROM NERVE DISEASES. J. S. McArdle. *Practitioner*, August, 1915.

This article is so old it is new. Like the fashions, it has come in again, but it is valuable information and bears repeating. The joint lesions are grouped under the term "arthritis neurotica," and described under three headings:

1. Those due to peripheral nerve injury.
2. Those due to central nerve injury.
3. To affections of the cord in absence of trauma.

The third type included joint troubles such as those accompanying tabes dorsalis and syringomyelia, and are left for discussion in a later paper.

One example of peripheral type is given in which cicatrix involving the posterior interosseous nerve caused arthritis of the phalangeal and meta-carpo phalangeal joints,—recovery followed subcutaneous section of the filaments caught in the cicatrix.

An example of the second type, a paraplegia arising from spinal injury and accompanied by severe inflammation of ankles, knees and hips, is given fully. Recovery followed counter irritation to the spine and internal administration of perchloride of mercury. Different theories as to the cause of the joint affection is discussed and a full clinical picture given, with the outstanding features of a differential diagnosis from various other joint affections.—*C. L. Wright, Toronto.*

THE RELATION OF LANDRY'S PARALYSIS TO POLIOMYELITIS. By M. Neustaedter, *Med. Record*, 1915, LXXXVII, pp. 436-7.

Neustaedter says Landry's paralysis may follow diphtheria, pneumonia, typhoid, variola, anthrax, influenza. The point of entrance of the germ is not known nor its manner of dissemination. Thus the disease is a clinical entity with varying pathological changes. These may be primarily in the peripheral nerves and confined to them or they may be myelitic only and again neurocellular. In poliomyelitis we have, he says, a uniform etiology, the nasopharynx is the point of entrance and the pathological changes are uniform in every case. It matters not what part of the central nervous system is affected. We have, then, in poliomyelitis a pathological entity with varying symptom complexes. There may be flaccid paralysis with muscle atrophy or spastic paralysis or cranial nerve involvement, also ataxias and tremors, or mixed types.—*M. S. Henderson, Rochester, Minn.*

AN APPARATUS FOR RADIAL PARALYSIS OF THE EXTERNAL POPLITEAL NERVE. By Sollier. *Bulletin Académie de Médecine*, August 3, 1915.

*Apparatus for the Radial Paralysis.*

The author has devised an apparatus which can be quickly and cheaply made and which allows a certain amount of independent flexion of the wrist and fingers. The apparatus consists of a glove of soft leather, extending 10 to 12 cm. above the wrist and is held in place by snap buttons or lacings. On the dorsal surface of this glove are narrow pockets of the same leather, one over each of the four inner metacarpal bones. These pockets extend above the wrist level to the metacarpo-phalangeal joints. A second series of separate pockets, placed under the first set, extend from the middle of the metacarpals to the juncture of the first and second phalanges. For the thumb there is a single pocket running from the head of the first metacarpus to the juncture of the first and second phalanges. Into these pockets are inserted pieces of spring steel with padded ends, 6 mm. broad and of variable thickness ( $\frac{1}{2}$  to 1 mm.)

*Paralysis of the External Popliteal Nerve.*

For the toe drop the author has devised a cheap and adjustable apparatus. This consists of an ankle of leather extending above the shoe top and lacing in front. On each side of the mid-line, in front, at the upper end, there are two strong hooks. For the tongue of an ordinary shoe, there is substituted an elastic band, 5 to 6 cm. broad. The upper border of this is made of strong leather which also holds two hooks. These hooks can be laced to the hooks of the leather ankle. The amount of tension can be regulated by a greater or less approximation of these sets of hooks.—*DeForest P. Willard, Philadelphia.*

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A CASE OF LANDRY'S PARALYSIS. By J. S. B. Stopford. *The Lancet*, June 5, 1915.

Stopford reports an interesting case of very rapid acute ascending paralysis which he classifies as a typical Landry's paralysis with the characteristic lack of pathology. He discusses the advisability of simplifying the nomenclature by applying the term "acute ascending paralysis," to an entity pathologically appropriate and using the term Landry's paralysis for a special type of ascending paralysis which does not show the morbid changes of poliomyelitis, polyneuritis, etc.—*Edward A. Rich, Tacoma.*

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PRESENT STATUS OF PROGRESSIVE PARALYSIS AND TABES. By V. Wigart. *Hygiea*, 1915, LXXXVII, No. 8.

There is no evidence that the usual mercurial treatment of twenty years ago had any efficacy as a relative protection against paralysis and tabes. Certain statistics indicate that such treatment actually shortens the interval between the infection and the onset of the paralysis or tabes. Wigart urges a compilation of statistics on a uniform basis in order to learn the exact conditions which favor or inhibit the development of tabes and the general paralysis. Cases should be tabulated in groups with like clinical course and unlike treatment, and also in groups with like treatment and unlike courses of the disease.—*Ellis W. Jones, Los Angeles.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

EXPERIENCES IN THE TREATMENT OF INFECTED JOINTS IN WAR. By Hans Burkhardt and Felix Landois. *Münch. med. Woch.*, May 25, 1915, LXII, No. 21.

Burkhardt and Landois had the advantage of working in a permanent, well-situated and fully equipped hospital. They received their patients early and were able to keep them for weeks or months for after-treatment.

Their principle of treatment of infected joints is that for simple abscess, *viz.* complete and well maintained drainage. This must be adapted to peculiarities of structure, a free excision of bone, minimal wound to surfaces to prevent absorption, avoidance of vessels and nerves, and the after functioning of all parts must be considered. Soft part injuries add grave complications. The resection of large bones must be coëxtensive with shattering. Hence the gravity of pelvic trauma.

In *wrist* injury they have used parallel radial and ulnar incisions with liberal removal of wrist bones and of arm bones when involved. At the *ankle* Kocher's incision externally, with an internal counter-incision with liberal resection of bone, if done early, is conservative and will forestall the necessity of amputation. Treatment of the *elbow* depends on the type of injury. If the joint has been freely opened simple removal of splinters may be sufficient. Slight involvement of the bones of the forearm may safely be left for later removal if necessary. If the wound has not freely opened the joint, Langenbeck's and Kocher's incisions are not sufficient. A posterior incision from one epicondyle to the other with free removal of bone must be followed by thorough fixation, generally by reinforced plaster with windows. Operative treatment of the *knee* depends on (1) the amount of bone shattering, (2) the degree of infection and the resulting general condition of the patients, and (3) the ability to carry out after treatment without moving the patient. Resection is contraindicated in (1) extensive tibial involvement, (2) in multiple injuries including the soft parts of the thigh and (3) in weakened individuals who do not withstand a long convalescence. Fracture of the knee will not repair without resection. An enlarged Textor incision has been followed by extirpation of the patella and under extension removal of the ends of the femur and tibia by horizontal section. After-fixation is of the utmost importance. Unpadded plaster attached to both upper and lower leg by adhesive, or a posterior wooden splint has given more efficient separation of the bone ends.

Conditions are changed in shoulder and hip wounds, the abundance of surrounding soft parts entailing as great or greater wound surfaces in articulation as in resection. The *shoulder* is generally accessible by the typical Lange incision, the head of the humerus removed as far as the surgical neck and the posterior drainage established. Permanent fixation is applied only after some days. Reinforced plaster, including the whole arm, and a jacket is ideal. Poor results outnumber somewhat the good ones, but among the latter are two in which suppuration extended under the scapula.

Infected wounds of the hip are among the most serious infected wounds and the mortality is very high. It is sometimes necessary in weak patients to drain the wound canal quickly to tide the patient over the worst of the infection and resect later. Temporary fixation by a long posterior splint, later followed by plaster.

To sum up:

"1. Resection of hand, foot and elbow give good results.



"2. Indications for resection of the knee-joint are good condition, moderate bone destruction and, in extreme cases, provided the patient can receive after treatment without removing him.

"3. Shoulder and hip wounds continue to present a doubtful prognosis. We recommend, from our experience, primary drainage; if the patient recovers, resection.

"4. Proper fixation is of utmost importance in that it hinders the absorption of toxic secretions.

"5. By keeping in mind anatomical conditions and principles of good drainage, one may attain good results from infected joints by field surgery."  
—*Freeman Bosworth, Boston.*

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AN ANALYSIS OF A CONSECUTIVE SERIES OF CASES OF VARIOUS FORMS OF ARTHRITIS, TREATED BY ILEOCOLECTOMY OR COLECTOMY. By C. H. Fagge and E. C. Hughes. *British Journal of Surgery*, April, 1915, p. 657.

A paper based on 33 Lane operations that have been more or less followed up by late histories and reports. Patients reported on condition of joint symptoms as compared to joint condition previous to the ileocolostomies. Results showed death in eight of the 33 cases, or 24% mortality. Two died shortly after operation. The other six deaths followed the operation from three weeks to fifteen months and were due to coxitis (three cases), empyema, and spinal caries (two cases). Operation was undertaken in 23 of the cases for the cure of tuberculous joints; 19 children and four adults. Six of these died. Of the remaining 17, nine reported and eight could not be traced. The nine reported cases showed slight improvement or no improvement other than that reasonably to be expected without the ileocolostomies.

Of more interest are the results of the Lane procedure in seven cases of multiple arthritis. One case died. Five are reported, and one case is lost sight of. Results in the cases varied from no improvement to one case practically cured of joint involvement. There was no improvement in old cases with bony changes in joints, but usually marked betterment in joints acutely involved.—*E. A. Rich, M.D., Tacoma.*

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THE RÔLE OF THE NOSE, THROAT AND ACCESSORY SINUSES IN THE ETIOLOGY OF CHRONIC INFECTIOUS ARTHRITIS. Roland Hammond. *Journal A. M. A.*, September 25, 1915, p. 1091.

The study was undertaken to show what proportion of the cases of chronic infectious arthritis has coëxisting disease of the tonsils, nose and ears. Nine out of 12 in one series had the tonsils removed. The results were not encouraging. In only a few cases has marked improvement been shown.—*Edward S. Hatch, New Orleans.*

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THE CLINICAL TYPE OF ARTHRITIS ORIGINATING ABOUT THE TEETH. Thomas B. Hartzell. *Journal A. M. A.*, September 25, 1915, p. 1093.

*Streptococcus viridans* is found not only in the abscesses of the teeth but also on the superficial tissues about the teeth, and is the cause of many cases of arthritis. The work of others is reviewed and a plea made for the early treatment of the dental abscess.—*Edward S. Hatch, New Orleans.*

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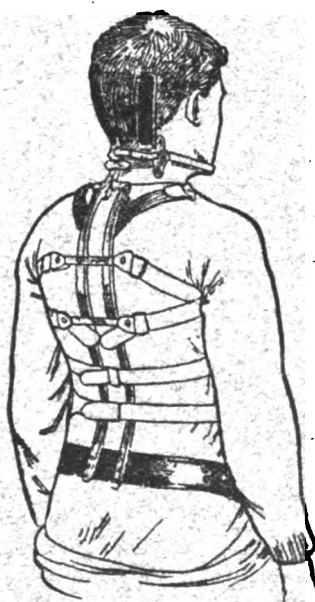
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## *The American Journal of Orthopedic Surgery*

### DEFORMITIES DUE TO INFANTILE PARALYSIS; OPERATIVE TREATMENT.

BY EDWIN W. RYERSON, M.D., CHICAGO, ILL.,

Professor of Orthopedic Surgery, Chicago Policlinic; Assistant Professor of Surgery,  
Rush Medical College.

THE published writings of members of the American Orthopedic Association show that differences of opinion exist in regard to the treatment of the deformities caused by anterior poliomyelitis. Some men believe in the simple correction of these deformities, and the maintenance of this correction by various forms of apparatus. Other men believe in the correction of the deformities, and the maintenance of this correction by means other than apparatus. Both groups of men being united upon the necessity of the correction of deformity, the difference therefore confines itself to the means of retention. .

It is undoubtedly true that some cases are best treated by apparatus. This is especially to be emphasized in the flail knee-joints, where both the flexors and extensors are paralyzed. Here no transplantations can successfully be done, and a stiffening operation is not usually so satisfactory as a brace with a lock-joint. If a single hip joint be flail, it is best to perform an arthrodesis. If both hip joints be flail, apparatus is a necessity. With these exceptions, practically all of the other leg and foot deformities and weaknesses can be treated better by operation than by apparatus.

The treatment by apparatus is both irrational and unsuccessful in all cases where there is marked deformity of the foot, because in such cases there exist healthy and active muscles, which, if divided, reunite and again become shortened, causing a recurrence of the deformity in spite

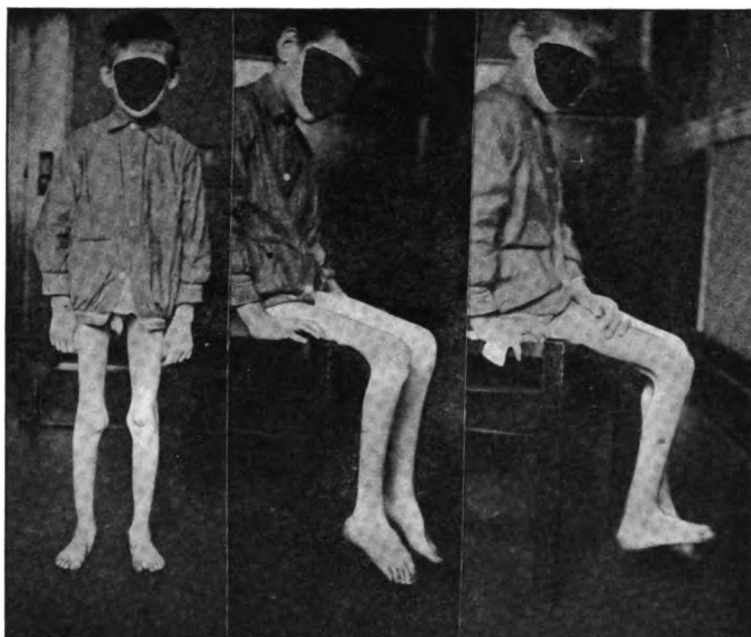


FIG. 1.

Paralysis of tibialis anticus, showing range of motion obtained by attaching toe extensors to metatarsal bones.

of apparatus. This cycle of operation and brace must be repeated again and again, until the healthy muscles have been so lengthened that they no longer have any contractile power, and the foot becomes a flail-foot. Moreover, muscles which might have been successfully transplanted have been rendered useless. This practice of repeated tenotomy and brace-wearing is to be strongly condemned. It is unscientific, and founded on a wrong conception of mechanics. The custom has developed from the results observed in the treatment of congenital talipes, where the conditions are entirely different. In congenital talipes there are no paralyzed muscles, and tenotomy, forcible over-correction and apparatus will always cure the deformity in early cases. In paralytic talipes, tenotomy, forcible over-correction and apparatus will never cure the deformity. Moreover, the braces and apparatus are heavy, uncomfortable, unsightly and expensive.

Eliminating the few who make up the inoperable class, there is an enormous number of people now wearing braces who, by safe and simple operative work, can be enabled to walk without any apparatus whatever.

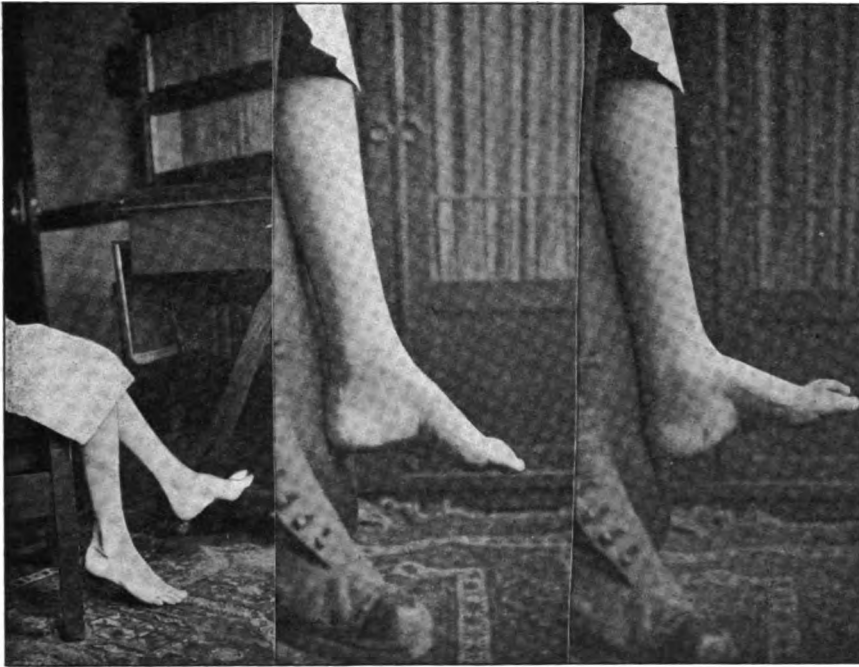


FIG. 2.

Before operation. Note dropping of anterior half of foot.

One year after transplanting extensor proprius hallucis to first metatarsal.

and usually more comfortably and actively than with the apparatus. The writer is thoroughly convinced that where any reasonable operative procedure can free the patient from the need of apparatus, it should be done. He has no axe to grind. He has invented no new operations, and champions no new fads. He simply appears before you with the plea that every suitable case of infantile paralysis be studied carefully and individually, with the idea of doing something radical which will enable the patient to walk without a brace. Many different procedures have been advocated. Nearly all of them have some value, and it is with the plan of weighing these values that this paper has been written.

#### GENERAL CONSIDERATIONS IN OPERATIVE WORK.

No radical operations should be performed until at least two years have elapsed since the attack of anterior poliomyelitis. During this time an attempt should be made to favor the return of power to all unpara-



FIG. 3.  
Paralytic equino-varus before operation.

lyzed muscle fibers. Deformity should be prevented, if possible, by apparatus, such as braces or plaster of Paris splints. Effort should be made to compel the patient to use actively the weakened muscles. Electricity, massage, and hot and cold water may be used to stimulate the nutrition of the muscles. If at the end of two years the condition is not satisfactory, a thorough anatomic examination should be made to determine what can be done by operation. Very young children should not be operated upon unless it is impossible to control the deformity by apparatus. If any kind of corrective operation be required, however, the radical procedures may be done at the same time, provided the two-year limit has been passed.

Consider first the most common paralytic deformity:

#### DROP-FOOT.

If the tendo Achillis be short, it should be lengthened by the splitting method, or by Bayer's tenotomy (cutting half-way through at the lower end of the tendon, and the opposite half an inch and a half above, and

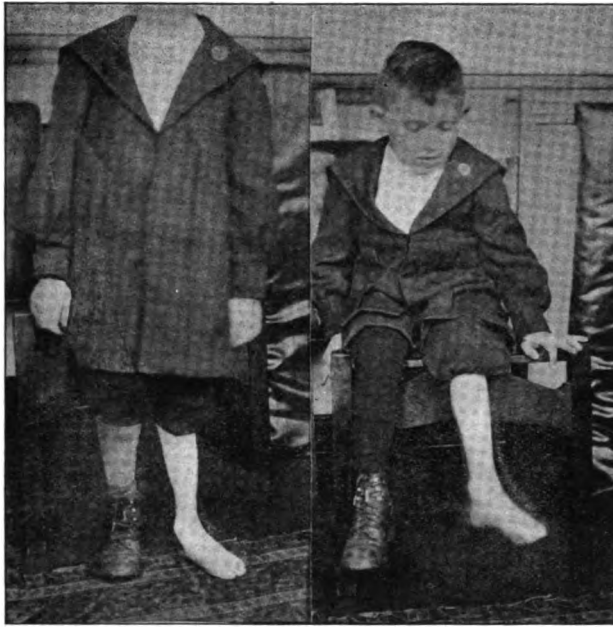


FIG. 4.

Same case 13 months after transplanting tibialis anticus to fourth metatarsal. Slight overcorrection. Result would have been better if attachment had been made to middle metatarsal.

“sliding” the tendon by a quick dorsiflexion of the foot). If the long extensors of the toes remain active, they may be fastened to the metatarsal bases, preferably by passing each through a hole drilled in its respective bone, or else by splitting the periosteum, gouging out a groove in the bone, and sewing the tendon into the groove beneath the periosteum. This operation has given many excellent results, although the actual strength of the combined toe extensor muscles, as determined by their cross-sections multiplied by their muscular length, is less than that of the tibialis anticus. The foot will show enough strength to carry an ordinary shoe without foot-drop and without recurrence of the equinus deformity.

#### PARALYSIS OF TOE EXTENSORS AS WELL AS OF TIBIALIS ANTICUS.

In this condition one or both of the peronei may be displaced forward in front of the malleolus, and sewed to the scaphoid or middle cuneiform.



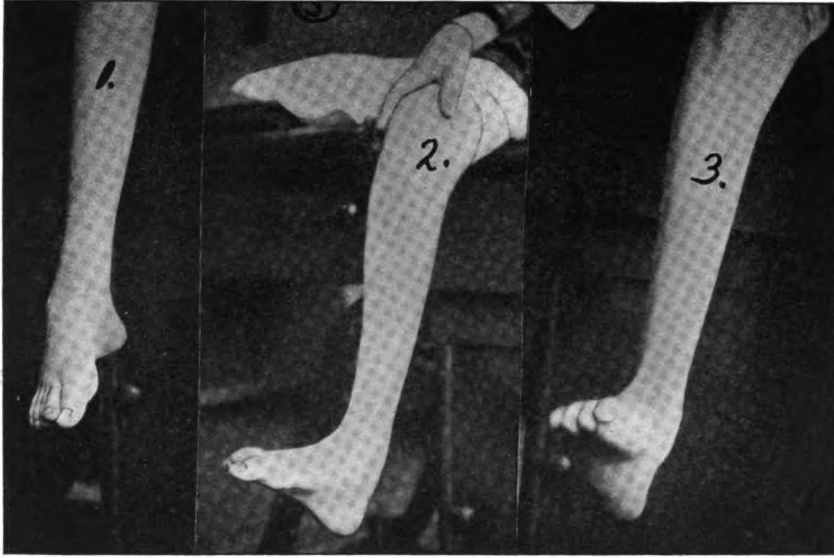


FIG. 5.

1. Equino-varus, 2 and 3. After transplantation of tibialis anticus to fourth metatarsal. Foot can be well everted, but should have had arthrodesis of astragalo-scapoid joint in addition.

It is better not to attach the peronei too far toward the toes, because the tendon will project under the skin at the bend of the ankle since there is no annular ligament to hold it back. It is also not advisable to pass a peroneus between the tibia and fibula, in the interosseous space, as it will almost always become adherent and fail to functionate actively, although it may form an excellent check-ligament. If the tibialis posticus be active, it may also be displaced forward, like the peronei, and may be needed to check the tendency to valgus. In the simple drop-foot, as well as in varus or valgus deformities, the astragalo-scapoid arthrodesis, as proposed by Soule,<sup>1</sup> should always be performed, as it is a powerful safeguard against lateral deviation. It can be done successfully at a much earlier age than the astragalo-tibial arthrodesis, but in young children the two bones should be sewed firmly together with several bichloride silk or kangaroo tendon sutures. With a heavy, short, full-curved needle the bones can easily be pierced without drilling.

In cases where the above muscles are all paralyzed, one may be tempted to split the gastrocnemius and pass one-half of it forward to act as a dorsiflexor of the foot. Out of at least fifteen cases where the writer has done this operation, he has failed to obtain active function in the muscle, although it acts as a good check-ligament.

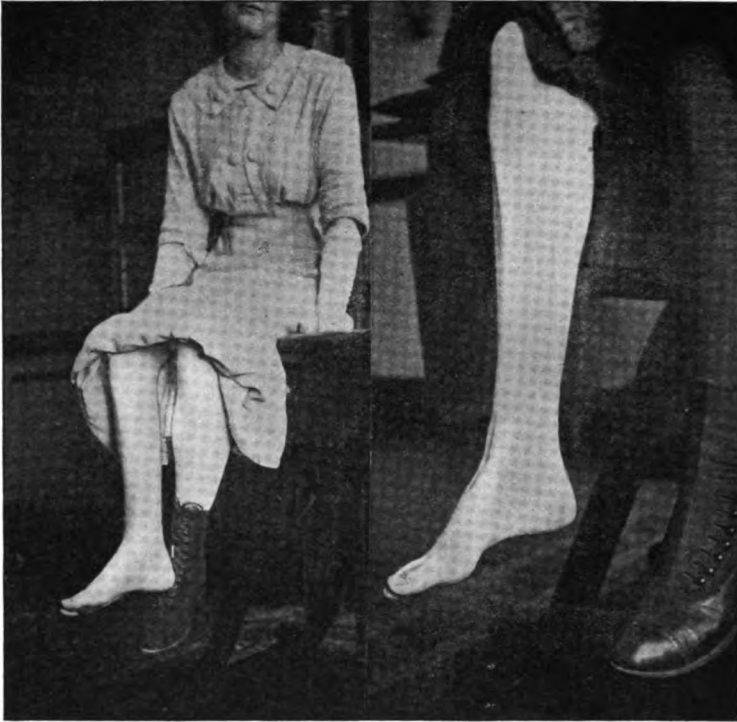


FIG. 6.

Nearly 2 years after operation for severe equino-valgus. Tibialis posticus passed through interosseous space. Toe flexors passed in front of malleolus. Both were attached to first metatarsal bone by silk. Note slight active power of dorsiflexion, and good position of foot. Excellent functional result. Operated June 24, 1913. Photo taken April 2, 1915.

It is better to abandon all attempts to gain active dorsiflexion, and to content one's self with fixing the foot at or near a right angle to the leg. There are several good methods of doing this. Arthrodesis (bony ankylosis) is not so satisfactory as one of the plastic methods, since it cannot well be done before the age of fourteen, and it gives an unnecessarily and uncomfortably rigid foot. Fastening the foot by ivory, bone or metal spikes or screws does not produce a permanent stability.

Gallie's<sup>2</sup> method of tendon fixation by burying the tendons in a groove cut in the tibia and fibula can always be depended upon to control the equinus, but in the writer's experience of twenty-five cases it has re-

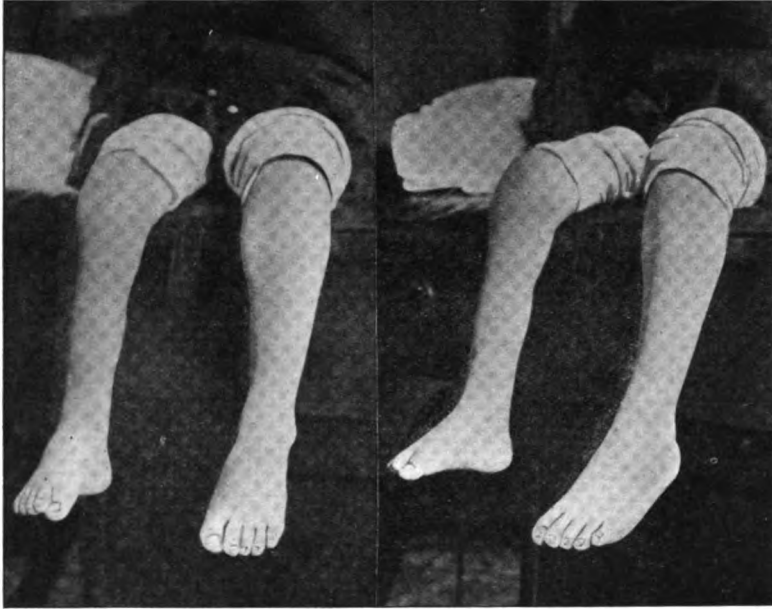


FIG. 7.

Right foot. Silk ligament suspension, one year after operation. Varus beginning to develop, and not well controlled by the outer silk cord.

peatedly failed to prevent lateral deviation. It should invariably be supplemented by arthrodesis of the astragalo-scaphoid joint, or by taking a strip of periosteum and bone from the tibia and implanting it in a groove cut along the inner side of the astragalus, internal cuneiform and first metatarsal bones. Putti's method covers the same ground as Gallie's, and perhaps affords a little more security against displacement during the manipulations connected with the operation and the application of the cast. The upper ends of the tendons are divided and passed through holes bored in tibia or fibula and then sutured. The writer has used it several times, especially in securing the peroneus longus and tibialis posticus.

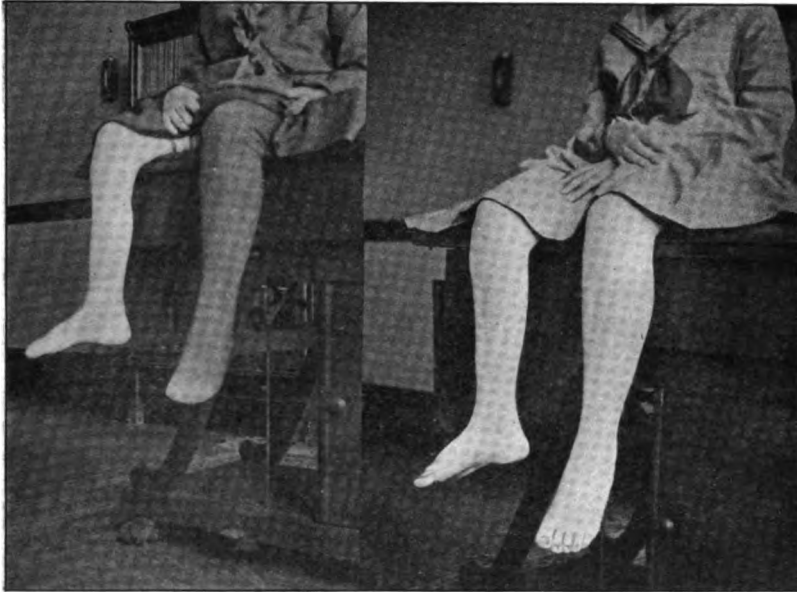


FIG. 8.

Right foot. Silk ligament suspension, operated July, 1912. Picture on left taken April, 1913. Picture on right taken April, 1915. Good result.

#### SILK LIGAMENTS.

The simple silk ligament suspension, with heavy bichloride silk cords from a hole drilled in the tibia, running down under the annular ligament to the inner and outer metatarsal bones, gives excellent satisfaction in cases where there is no lateral deformity. It should be combined with astragalo-scapoid arthrodesis as a routine measure. In rare cases the silk may give trouble, especially if the knots be tied over the inner subcutaneous surface of the tibia. They should always be tied on the outer side, in the sheath of the tibialis anticus.

#### PES CALCANEUS.

For this deformity, Whitman's operation is the best, when performed in accordance with its author's excellent technic. With the Bartow and Plummer's method of intra-articular silk ligament stabilization the writer has had no experience.



FIG. 9.  
Silk ligament suspension, 2 years after  
operation. Woman 37 years old.



FIG. 10.  
Silk ligament suspension. Good  
result.

#### THIGH PARALYSIS.

Considering now the paralysis of the extensor quadratus of the thigh, the writer can confidently recommend the transplantation of a healthy biceps and semitendinosus forward into the patella. He has many cases which show active and useful extension of the leg secured by this method, and others where marked increase in the stability and usefulness of the knee has resulted even though the leg cannot actively be extended against

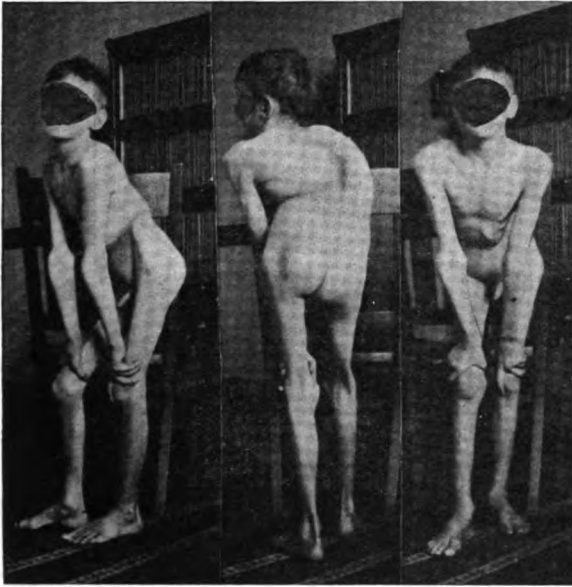


FIG. 11.

September, 1912, 3 years after attack. Can walk a little, but with difficulty. Quadratus extensor paralyzed on both sides.

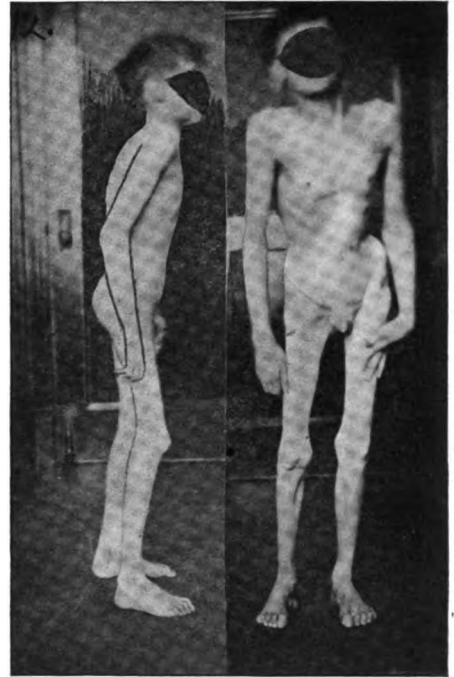


FIG. 12.

Same case, 2 years after transplantation of semitendinosus and biceps into patella. Very slight actual function in transplanted muscles, but marked improvement in carriage and gait.

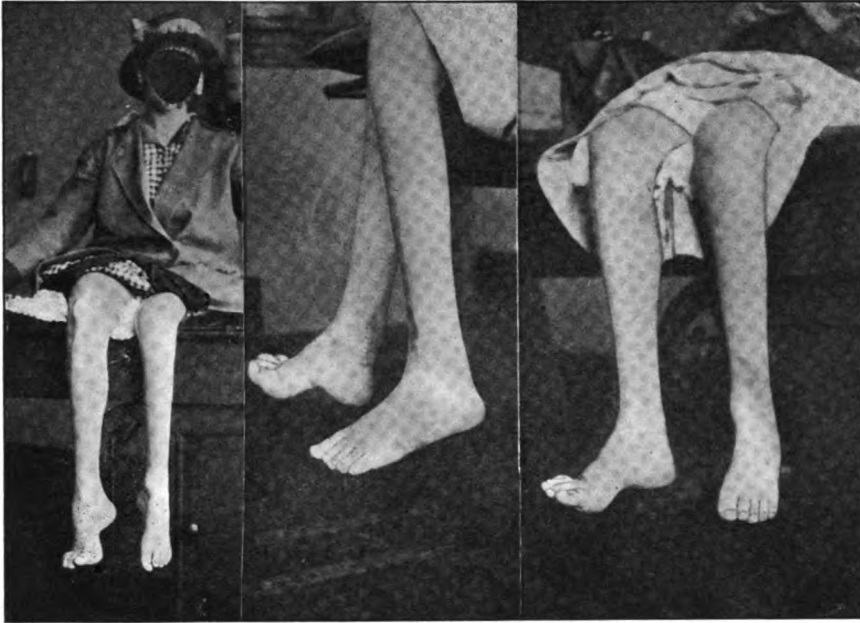


FIG. 13.

Before operation. Right foot, equinovarus. Left foot, completely flat. Seven months after operation. Left foot, silk ligament suspension. Right foot, toe extensors attached to metatarsal bones. Good functional result.

the force of gravity. It is not wise to do this operation unless the semi-membranosus or the gastrocnemius be active, since a genu recurvatum might otherwise develop.

In contractures of the tensor fasciae latae and other structures around the hip, the subperiosteal method of Soutter<sup>4</sup> is excellent.

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- <sup>2</sup> Gallie, W. E.: Annals of Surgery, Mar., 1913, Jan., 1915; AM. JOUR. ORTH. SURGERY, January, 1916.
- <sup>3</sup> AM. JOUR. ORTH. SURG., May, 1913.
- <sup>4</sup> Soutter: Boston Med. and Surg. Jour., Mar. 12, 1914.

## BONE-GRAFTING FOR SPINAL CONDITIONS. REPORT OF 40 CASES.

BY J. TORRANCE RUGH, M.D., PHILADELPHIA.

IN the minds of many operators and observers, much doubt still exists as to the true value of the bone-graft in the treatment of disease and other conditions of the spine. This doubt is founded in some instances upon personal experience with the method, and in others upon lack of personal experience and a plethora of skepticism for any radical departure from old and tried methods. Furthermore, it is claimed (and perhaps justly) that the method of treatment is not yet five years old, and therefore we cannot know the ultimate results. There is an element of truth in this, but as there are also truths of equal importance on the other side of the problem, proper consideration must be had of all in our final determination of its value and merit.

While the writer's attitude is entirely favorable to the operative treatment of certain spinal diseases and conditions by the transplantation of a bone-graft, I realize fully the newness of the work and the uncertainty as to its effects, immediate and remote, upon the disease both *in situ* and throughout the body. I do not purpose considering the history of the bone-graft after it has been planted in the spine, as the problem, though interesting from a scientific or controversial standpoint, scarcely concerns the operator seeking results for his patients.

In the *International Clinics*, Vol. 1, 23rd Series, I reviewed the history of the operative treatment of tuberculosis of the spine, showing that not quite twenty years were covered in perfecting the technic since Hadra first suggested before the American Orthopedic Association wiring the spinous processes to secure fixation and support. Many years more must pass before the real history of the operation can be finally written. Whatever of experience, however, that can swell the sum total of the work that has been reported should be added, and this is the justification of the present report.

I cannot forget Lange's comment on the treatment of tubercular processes, during his memorable visit to the American Orthopedic Association in 1910. He said in substance, "We must work for two things in our treatment of these cases (surgical tuberculosis): first, we must put our braces under the skin, and second, we must shorten the time for recovery of our patients." Both of these principles are sound and both



are involved in the bone-grafting procedure. All orthopedic surgeons recognize the difficulties which beset the case of spinal caries, whether in child or in adult, and all feel that if consolidation of the spine can be secured promptly, the disease will, in most cases, become quiescent.

One great advantage of the bone-grafting operation is that it accomplishes this fixation in less than a year's time. This is in marked contrast to the four to ten years required by the other methods of treatment. A second advantage is that under the influence of this fixation, nature will more rapidly fill in or solidify the diseased area. There is no traumatism of function to aggravate the pathologic process and continue its activity.

A third advantage is that an abscess formed or in process of formation will usually disappear under the efficient fixation of the bone splint. Under other methods of treatment, it may disappear if the mechanical support and fixation are complete, but may have to be tapped or opened and oftentimes will not close spontaneously. A fourth advantage is the very low mortality rate following the operative procedure. The shock is extremely slight, and if proper asepsis is observed, and the technic of operation is correct, the success of the work is practically assured.

A fifth advantage is that the manipulations are all done in normal, healthy tissues in the vast majority of cases. Several instances have occurred in which the tubercular process had extended around to the posterior spinal segments and invaded the field of operation, but even in some of these the graft grew in place and seemed to show a certain degree of resistance to tubercular infection. It can be positively stated that in non-infected cases, the fault lies with the operator or the post-operative care if the area becomes infected. A sixth advantage is the economic one, which, in the case of the wage earner, makes him again an independent instead of a dependent member of the community in at most a year's time. If no other argument were presented to justify operation in a case, this one alone would be sufficient, and it needs no elucidation or defense.

In my work, covering forty cases, I have found no disadvantages that could be attributed to the operation. Those which have been presented by operators have been the result of faulty technic and not of the operation. Among these are suppuration, loss of the graft, failure to hold, and increase of the deformity subsequently (either from a too short graft or from an extension of the disease to the vertebrae beyond the graft). In our future experience and observation, we may find that, as time passes, these cases may show some unfavorable development that is not observed after other methods of treatment, but it will have to constitute

a considerable number to equal or surpass the lamentable relapses and complications that arise in these cases under the old methods of treatment.

In this connection, I wish to reply to an argument regarding the production of ankylosis in all tubercular joints, as advocated by Lorenz and his followers, as being justified by this spinal work. In the first place it is quite generally conceded that with the firm ankylosis of an affected part, the tubercular process in the majority of cases, becomes quiescent—which is equivalent to a cure. However, it does not follow that without ankylosis the process may not also become quiescent. In many cases it does disappear and good function is restored to the joint. Furthermore, in the spine one may produce fixation of five or six joints with but little interference with the total spinal functions, while in a single joint conditions are quite different. The reasoning by analogy is not in the least justifiable. Why, then, should an individual be doomed to a stiff hip or knee if there is a chance of good recovery with function? Familiarity with the arguments in favor of the ankylosis treatment fails to find this question convincingly answered, and we do not consider that the same radical measures are applicable in both instances.

In our experience and belief, up to the present time, the operative fixation of the spine is the treatment of choice, for spinal caries and certain other conditions, and especially so in the cases past twelve or fourteen years of age.

Since June, 1912, I have placed forty grafts in the spine for spondylitis, and in this series the mortality has been nil, and I have lost but one graft, viz: the thirteenth. The patients ranged in age from three to fifty-four years, and there were twenty-four males and fifteen females. There were one each at 3, 4, 6, 8, 9, 13, 14, 16, 18, 20, 28, 29, 33, 37, 39, 41, 43, 50, 51, 52 and 54 years; two each at 5, 19, 23, 26, and 31 years; three at 25 years and four at 24 years, the average being 25 years.

Occupation varied. There were 8 laborers, 4 housewives, 3 clerks, 2 nurses, 2 machinists, 1 stenographer, 1 school teacher, 1 servant, 1 mill worker, and 15 had no occupation.

The disease had existed from six months to twenty-seven years prior to operation. There was a history of involvement for 8 months, 9 months, 4 years, 5 years, 12 years and 27 years in one case each, 7 years in three cases, 2 years in four cases, 3 years in four cases, 6 months in five cases and 1 year in sixteen cases.

The kyphos was in varying stages of prominence, from very slight to very severe.

The location of the disease was cervical in 1, dorsal in 15, dorso-lumbar

in 2, lumbar in 17, lumbo-sacral in 1 and sacro-iliac in 2, and there were from 2 to 5 vertebrae involved in all excepting the sacro-iliac cases.

The following complications were present before operation: Abscess, cervical, 2; abscess, lumbar, 4; abscess, psoas, 9; sinuses, 8; Pott's paralysis, 3; spinal cord irritability, 3; lateral bending of spine, 1; pulmonary tuberculosis, 1; mastoid, suppurating, 1.

The following complications developed subsequent to operation: Fracture of graft at end of six months, 1; fracture of tibia at four weeks, 1; loss of graft from surgical error, 1; abscess, hip, 1; abscess, iliac, 1; Pott's paralysis, 2; pulmonary tuberculosis, 3; pyocyaneus infection, 1.

The average length of time the cases remained supine was six weeks, and the average time of wearing a support was six months. The average length of the graft was six inches, and there was no suppuration in any graft, though there were four or five cases of stitch infection. Kangaroo tendon was used to fasten the graft, and No. 2 chromic catgut was used to close the fascia and the skin. The latter was sewed by a subcuticular stitch in nearly all cases. The results are as follows: excellent, 26 cases; improved, 5 cases; not relieved, 2 cases; died, 5 cases (one in 27 months and one in 15 months of pulmonary tuberculosis; one in 8 months from heart disease; one in four weeks from pyocyaneus infection from mastoid disease, and one in 2 years from an unknown cause); not heard from, 1 case; and too recent for results, 4 cases.

We have included three of the cases which died, and in whom the spinal condition was entirely relieved, as excellent, and this in a total of 35 patients to be counted, gives us 74.3% of excellent results. When, too, it is remembered that these results have all been secured within a year after operation, the value of the method in these conditions becomes at once established. We have fulfilled Lange's requirement in that we "have placed the brace under the skin and have shortened the time of efficient recovery."

CASE 1. J. S., 23 years, a machinist. Ill nine months following an accident while riding a bicycle. Disease dorsal, slight kyphos. Operation June 18, 1912. Convalescence rapid and normal. Began repairing automobiles in October, 1913, and is constantly employed ever since.

CASE 2. Miss E. F., 37 years, nurse. Injured by patient in a hospital four years before. Disease dorsal, slight kyphos. Operation July 16, 1912. Convalescence normal. Became self-supporting in October, 1912, and has worked ever since. "Does not know she has a back."

CASE 3. J. O'D., 25 years, machinist. (With Dr. J. J. Gilbride). Ill one year since fall from a building. Disease dorsal and kyphos moderate. Operation August 28, 1912. Convalescence satisfactory. Began working one year later.

CASE 4. A. W., 19 years. Ill seven years. Disease lumbo-sacral. Kyphos slight. Cord irritability. Operation September 3, 1912. Recovery good. In January, 1913, broke the graft when sitting down. Plaster jacket worn for nine weeks when graft was united. (Second operation, see Case 13).

CASE 5. F. C., 33 years, carpenter. Ill for a year following a blow on the back (mid-dorsal region) by a heavy beam. Disease dorsal with slight kyphos and lateral deviation. Operation September 5, 1912. Recovery uneventful. Began working in March, 1913, and has continued ever since. In September, 1914, fell from a scaffolding and broke a rib and a leg, but has had no trouble from his spine.

CASE 6. Mrs. E. W., 54 years, school teacher. Ill at times for years and had pains in back with stiffness for a long time. Disease lumbar with slight kyphos. Operation September 21, 1912, when condition was found to be osteitis deformans. Graft placed. Recovery slow and tedious. Has no more pain in spine and takes care of her apartments.

CASE 7. F. T., 24 years, laborer. Ill for one year. Disease dorsal and kyphos slight. Operation September 21, 1912. Recovery complicated by his jumping out of bed at end of fourth week and fracturing the robbed tibia incompletely. This united firmly. Four months later, the upper end of the graft pushed through the skin. It was removed with forceps, the wound healed, and he is now a laborer as of yore. He was the most unruly and the worst patient I have ever operated upon.

CASE 8. Mrs. I. B., 28 years, colored, housewife. Pain in back for five years. Three months before operation, the back suddenly bent forward, forming a large kyphos in the lumbar region. Operation October 17, 1912. Recovery uneventful, and she nursed her three-months' old baby since the day after the operation. Had pneumonia in January, 1913, but recovered nicely. In October, 1913, developed a lumbar abscess, which was tapped four times and then disappeared. Her present condition is not very good. The spine is rigid and strong, but her lungs are showing evidence of infection.

CASE 9. P. D., 5 years. Ill since 27 months of age. Disease lumbar, with marked kyphos and discharging psoas abscess. Treated variously

without result. Operation November 30, 1912. Recovery slow, but at present is growing rapidly and goes to school every day. A sinus still persists on the left side anteriorly, three years after operation.

CASE 10. F. W., 31 years. Ill for 27 years. Paralysis 1901, and again from 1904 until the end. Had numerous abscesses and sinuses and urinary incontinence with marked spasticity of legs. Disease, dorso-lumbar. Operation asked for as last chance. Operation December 14, 1912. Slight infection of lower edge of incision from urine, but healed kindly. Pressure sores over kyphos baring graft, but it did not come out. Left the hospital six months later. Died in December, 1913, of generalized miliary tuberculosis.

CASE 11. F. S., 24 years. Ill 7 years. Disease lumbar and kyphos slight. Had a left iliac abscess two years before, which disappeared after tapping. Operation January 25, 1913. Insertion lumbo-sacral. Graft broke in two pieces in removing it from the tibia, but was placed in the spine and recovery was normal and rapid. Now is working and self-supporting and has been for a year. "Does not know he has a back."

CASE 12. G. P., 43 years, clerk. Ill for six months. Disease lumbar. No kyphos but constant pain over left ilium and groin. Operation, March 20, 1913. Recovery satisfactory but never had entire relief from pain. Patient of a very nervous disposition and was able to work only for about a year, when he gradually failed, lost power in his left leg with atrophy of the muscles, and in February, 1915, died, but the cause of death has not been obtainable as he lived in a small town in a neighboring state.

This case was an undoubted one of tubercular caries of the lumbar spine, as shown by the examination and x-rays, but the lesion which developed further and ultimately removed him is unknown.

CASE 13. (Same as Case 4.) After the fracture of the first graft, it was thought best to strengthen this by a second one on the opposite side of the spine. Operation April 5, 1913. The incision for the first operation was a straight central one, and for the second, a curved one with the base along the scar of the first. The skin became devitalized, sloughed, and exposed the graft, which came out in four to five weeks. The back healed and the spine proved strong and firm. She then developed pulmonary tuberculosis, was removed to the Jewish home for consumptives, where she died in December, 1914. She also developed an abscess which opened over her right hip about three months after this operation and never closed.

CASE 14. P. G., 14 years. Ill twelve years. Had double psoas abscesses with sinuses almost from the beginning of his trouble. Operation January 28, 1913. It was intended to do a Hibb's, but on uncovering the spines, pus was found about four of the lumbar spines, and the original Albee operation of splitting the spines and turning down one-half to the part below was done and the wound closed. Union by first intention occurred and he improved markedly for a year, then began to fail. Several sinuses opened in the back over the site of operation, but no bone has been thrown off. At present his left lung is involved, and the ultimate end seems not far distant.

CASE 15. Miss J. Y., 25 years, servant. Ill three years. Had two large psoas abscesses at time of operation. Disease dorso-lumbar and kyphos slight. Operation September 26, 1913. Recovery uneventful. Brace for eight months. Working at housework fifteen months later and weighs more than ever before. No trouble with spine, and abscesses have disappeared.

CASE 16. J. T., 24 years, colored, laborer. Ill for one year. Disease dorsal and kyphos moderate. Operation November 18, 1913, at Philadelphia General Hospital. He was unruly and would not wear a cast. Left the hospital in eight weeks with wounds perfectly healed. Have not been able to locate him.

CASE 17. W. J., 13 years, colored. Ill one year. Disease dorsal with moderate kyphos. Operation February 19, 1914. Recovery excellent. Brace for five months. Died in October, 1914, from heart disease, but the particulars of the history were not obtainable, as he lived in a neighboring city.

CASE 18. Miss K., 20 years, mill-worker. Ill one year. Disease lumbar, kyphos slight and has a right psoas abscess. Operation February 24, 1914, at Reading Hospital, Pa. Recovery uneventful. Wore cast six months. At work in mill nine months after operation. Abscess tapped in April, 1915.

CASE 19. A. M., 41 years, colored, laborer. Ill 8 months with rather acute spinal symptoms. Disease lumbar. No kyphos. Had acute mastoid infection in December, 1913, and operated for this in January, 1914. Operation on the spine March 17, 1914. Had discharging sinus back of ear and a small psoas abscess on right side at time of operation. This patient had the heaviest tibia of any case I have ever operated upon. The graft was about one-half inch thick, but the medullary canal was not

opened. He progressed normally and satisfactorily for three and one-half weeks. The wounds healed by first intention. He then became gradually comatose and died in three days. Post-mortem examination showed pyocyaneus infection of the mastoid, of the pleural cavity on one side and of two psoas abscesses, one having developed since operation. The graft was uniting firmly to the spinous processes and there was no infection at the site of operation, either in the back or in the leg. New bone was depositing from the spines into the graft. The infection evidently came from the mastoid, and the case tends to prove Albee's contention as to the degree of resistance on the part of the graft and the immunity of the field from infection if proper asepsis is observed.

CASE 20. Miss A. D., 23 years, stenographer. Ill for two years with supposed sacro-iliac disease. Disease lumbar. Operation April 2, 1914. Graft attached to lumbar and two sacral spines. Recovery uneventful. Nine months later began work as bookkeeper and feels perfectly well.

CASE 21. M. F., 6 years. Ill six months. Disease, very high dorsal, with kyphos forming. Extension in plaster for several months. Operation May 21, 1914. Graft seventh cervical to fourth dorsal. Wore jacket constantly, but three months after operation before being allowed to sit up, she developed spastic paralysis of the legs, but had no involvement of the bowels or bladder. She is improving now and her recovery seems to be only a matter of time. The spine is firm and fixed. The home surroundings in this case are entirely against her recovery, but we are unable to change them. In spite of the unfavorable conditions, she is recovering. (Died of tubercular meningitis in June, 1915.)

CASE 22. Mrs. A. F., 26 years, housewife. Ill one year. Disease mid-dorsal. Had a sinus in the side of the neck which communicates with the focus of disease in the dorsal vertebrae eight inches down the spine. Slight kyphos. Operation May 25, 1914. Recovery prompt. Brace for eight months. At present, sinus still runs a very little, but she is doing her own housework. Autogenous vaccines and later atophan hypodermatically failed to close the sinus.

CASE 23. T. K., 18 years, laborer. Ill for three years. Disease high dorsal. Total paralysis below the waist line for one year. Extension used unsuccessfully for six months. Operation June 6, 1914, at the Philadelphia General Hospital. Stitch abscesses in the back wound, but no other complication. Walking about in five months and discharged from the hospital at end of six months in good condition. Now driving a delivery wagon.

CASE 24. Anna L., 9 years. Ill for six months. Disease dorsal but no deformity. Operation June 11, 1914. Recovery normal but devel-

oped paralysis after ten weeks. This still persists, but is lessening in degree. The spine is held rigid by the graft so that the paralysis must be due to a proliferation about the cord, independent of the operation. She is now in the North American Sanitarium for Bone and Joint Tuberculosis at Ventnor, N. J., and is improving satisfactorily. (Paralysis found to be due to second focus in lumbar region.)

CASE 25. E. B., 25 years, laborer. Ill six months. Disease low dorsal, with moderate kyphos. No complications. Operation August 14, 1914, at Philadelphia General Hospital. In plaster four months. Now, May 1, 1915, beginning to work and back feels strong.

CASE 26. C. S., 26 years, laborer. Ill one year. Disease dorsal, slight kyphos. Operation August 6, 1914, at Philadelphia General Hospital. Recovery uneventful. Support off at five months. Now, May 1, 1915, doing light work.

CASE 27. R. R., 52 years, clerk. Ill two years. Disease mid-dorsal, kyphos marked and paralysis present for two months. Also had pulmonary tuberculosis, which has become quiescent. Operation August 13, 1914, after three weeks' extension. Graft broken into three pieces to fit about kyphos. Fixation for five months. Paralysis all gone at end of four months, and is now, May 1, 1915, able to walk about perfectly and is gaining strength constantly. Has also gained considerable weight.

CASE 28. Mrs. B. D., 51 years, housewife. Ill for one year, and for three months has had evidences of spinal irritability and pressure. Operation September 29, 1914. Graft attached to lower four lumbar vertebrae and first two sacral spines. Convalescence normal. Knee-jerks normal and ankle clonus disappeared in six weeks. May 1, 1915, walking everywhere and wearing only ordinary corset for support.

CASE 29. P. S., 16 years. Ill two years. A physically inferior boy. Disease in the lumbar spine with obliteration of the lordotic nerve. Operation October 6, 1914. Recovery prompt. Now gaining in weight and general physical condition is improving. Brace discarded after six months.

CASE 30. T. S., 4 years. Ill six months. Disease in lower dorsal spine. Large psoas abscess in right side, extending below Poupart's ligament. Operation October 8, 1914. Dorso-lumbar graft. No complications. Still wearing brace. Abscess has been tapped four times and has practically disappeared. Runs freely as other children.



CASE 31. J. K., 3 years. Ill one year, and for most of this time was on a Bradford frame. Disease in mid-dorsal spine. Right lumbar abscess tapped three times before operation, and last tap wound has been discharging constantly. Slight spastic paralysis at time of operation. Operation October 10, 1914. Recovery prompt. Still wearing support, June 1, 1915. Paralysis has disappeared, general health is much improved and he is gaining all over.

CASE 32. J. S., 8 years. Ill one year. Disease dorso-lumbar, kyphos moderate. Operation October 27, 1914. Recovery rapid. Still wearing jacket. Condition excellent and is constantly improving at the North American Sanitarium at Ventnor, N. J.

CASE 33. W. E., 39 years, laborer. Ill one year and had lateral bending of the spine, with slight kyphos in lumbar region. Operation October 31, 1914. Graft attached to four lower lumbar and first two sacral spines. Support for five months. Condition much improved though not yet able to work.

CASE 34. Mrs. C. S., 29 years, housewife. Ill one year. Disease lumbar with very slight kyphos. Operation November 21, 1914. Recovery prompt. Support for five months. Now doing her own housework (six months since operation).

CASE 35. C. S., 50 years, clerk. Ill one year and has had slight attack of pulmonary tuberculosis, but has recovered from it. Disease lumbar. Operation November 28, 1914. No complications. Support discarded after five months. Four months after operation developed left iliac abscess, which has been tapped twice in three weeks and has practically disappeared. Condition very greatly improved and able to do a little work in a store.

CASE 36. J. H., 5 years. Ill two years with atlo-axoid disease and has a healed sinus on left side of neck. Was paralyzed, but had recovered sufficiently to walk, though is still slightly spastic. If the head was tilted forward to a level position, he became paralyzed after five or six hours. Operation March 6, 1915. Graft placed between the occiput and the third and fourth cervical spines. Hole was dug in the occiput to admit end of graft. Is still wearing head and body cast, but sinus on side of neck opened and discharged for a week and then closed. Graft wound healed promptly. Knee jerks are still plus and ankle clonus is very slightly present. This is the first case in which a graft has ever been placed in this region.

CASE 37. W. W., 24 years, machinist. Ill for one year. Disease in lower lumbar region. Obliteration of lumbar curve. Operation March 30, 1915. Graft attached to lumbar and sacral spines. Convalescence rapid and no complications. At end of two months is going everywhere and feels excellent.

CASE 38. Miss G. McM., 31 years, nurse. Ill for four years. Has been operated for perinephric abscess, but none found. Then treated for relaxed sacro-iliac, but grew worse under exercises. X-ray showed focus of disease in left sacro-iliac. Operation January 12, 1915. Graft placed across back of sacro-iliac joint by mortising posterior part of ilium parallel with posterior surface of sacrum and raising flap of periosteum from the sacrum. Patient now able to go about comfortably and gives every evidence of relief from strain by fixation of the joint.

CASE 39. Mrs. E. H., 35 years, housewife. Suffered for six months from slipping of right sacro-iliac joint. Unable to maintain parts by bandage, corset or plaster. Operation April 17, 1915. Graft was taken from the left tibia. Second day after operation, patient complained of numbness in entire left leg. As the graft had been placed in the right sacro-iliac, the complication was ascribed to the neurotic state of the patient, and this proved correct, as the numbness disappeared in two days. It is here suggested that in similar types of operation, this same relation of graft-removal and insertion be observed, as it will prove most comforting to the operator by eliminating the possibility of confusing cause and effect. The plan is to take the graft from the side opposite that into which it is to be inserted. This case is making an entirely satisfactory recovery.

CASE 40. Miss M. B., 31 years. A most exaggerated right dorsal scoliosis lasting for 20 years. Had extreme pain in stomach and abdomen, marked sallowness of complexion from intestinal toxemia and was unable to eat any quantity of food without having severe pains. Extension in bed for four months, with complete cessation of pain after first four days. Operation April 1, 1915, by Dr. Albee for the writer. Graft placed on the concave side of the spine. No fixation employed. Patient out of bed in six weeks and is in perfect condition, with no pain, clear complexion, regular bowels, and is able to eat anything she desires without pain or discomfort.

The results in this case have been most striking, and there is no sign of return of the spine to its former position of pressure and interference with functions.

## FRACTURES OF THE SPINE WITHOUT PARAPLEGIA— A STUDY OF ELEVEN CASES.

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FRACTURES of the spine are usually noted as uncommon, and signs referable to a synchronous injury to the spinal cord are considered necessary to establish the diagnosis. That spinal fracture may occur without medullary symptoms is recognized, but is considered the exception that proves the general rule.

However, during a six months service in the male surgical division of the out-patient department of the Massachusetts General Hospital—from February 1, 1915, to August 1, 1915—ten patients who sought relief for pain in the back were found to have a fracture of the spine. And during this same period one patient with spinal fracture was treated in the orthopedic division. These patients were all ambulatory, and attempts to elicit a history of symptoms that might indicate cord compression were vain. Not one had at any time had any motor or sensory paralysis or sphincteric disturbance.

In a recent review of 133 cases of spinal fracture treated at the Massachusetts General Hospital between January 1, 1900, and December 31, 1914, 106 patients were found to have applied for treatment within forty-eight hours of the receipt of injury. Fifteen per cent of cases with fracture in the cervical region, 32.4% of patients with fracture in the dorsal region and 48.3% of patients with fracture of the lumbar spine, presented no signs of damage to the spinal cord.

A special study was made of the signs of fracture of long bones as applied to spinal fractures. Swelling, contusion or discoloration of the skin at the site of fracture was noted in 21.7% of the cases, crepitation in but 7.5% of the cases. Deformity, either a kyphos or a palpable tumor in the pharynx—in cases of fracture in the cervical spine—was present in 48.1% of the cases. Localized tenderness over the spinous process or in cases of fracture of the transverse processes in the lumbar region—of which there were 5—just lateral to the spinous processes, was the most constant local sign of fracture noted in 63.2% of cases. Moreover this figure underestimates the frequency of localized tenderness, for in seven instances where contusion or hematoma are noted in the records,

no mention was made of localized tenderness. Further, several patients were either unconscious or in such poor condition when the examination was made that the presence of tenderness was not determined. But from these figures, even, a general statement that localized tenderness may be expected over the spinous processes of fractured vertebrae is warranted.

The present series embraces eight compression fractures and one fracture dislocation, and two cases of fracture of the transverse processes of the lumbar vertebrae.

Compression fractures are caused indirectly by falls, blows or collisions with trains or automobiles, which result in a hyperflexion of the spine. On the bodies of the vertebrae and the intervertebral discs falls the chief strain, and the elasticity of the discs being overcome, the inelastic cancellous bone of the vertebral bodies is compressed. If this hyperflexion of the spine does not compress the cord between the bodies and the laminae before the recoil comes, the cord escapes injury.

Fractures of the transverse processes, on the contrary, are caused by direct force. In the cervical region the transverse processes are too short to receive the force of a blow; in the dorsal segment of the spine, the backward bowing of the ribs exposes them to the force of blows, while at the same time it protects the transverse processes; but in the lumbar region the transverse processes are long and slender and unprotected. And it is in the lumbar segment of the spine that fractures of the transverse processes are not uncommon. But all too frequently the cause for the persistent and disabling pain is overlooked because the local signs are not well marked.

Pain in the back—that troublesome complaint, distressing to patient and surgeon alike—is the chief subjective symptom, and may be the only symptom in the types of fracture here considered. This pain is well localized and constant. In none of the cases in this series did it radiate, nor were there any other signs of nerve root pressure. In compression fractures, especially, the steady pain is exaggerated by any motion that changes the line of weight of the body. Rising from the sitting to the erect position always increases the pain, as does rising from the recumbent position. Flexion and hyperextension of the spine are conscientiously avoided by these sufferers, although these motions cause very temporary increase in the pain.

In addition to the pain, some of the patients complain of the back tiring on very slight provocation. Frequent change of position gives these patients the greatest relief, in spite of the momentary increase in pain accompanying such change in position.

Objective signs of spinal fracture may be conspicuous by their absence.

No deformity is expected in fractures of the transverse processes, but in compression fractures, a kyphos is expected—less sharp than in Pott's disease—but still an easily observable kyphos. Such however is not the case, and it is in part due to this fact that these fractures are so generally unrecognized. The kyphos in ambulatory compression fractures is so slight that it may readily be classified as bad posture. The exaggerated upper dorsal curve seen in moderate round shoulders is the typical kyphos in fractures of the upper dorsal spine, while in the dorso-lumbar region, instead of a kyphos, the concavity of the lumbar curve is lessened or obliterated, giving rise to the flat back seen in many postural strains. In the mid-dorsal region, however, the knuckle is evident and should give the clue to the correct diagnosis.

A very valuable and almost constant sign in compression fractures is dis-alinement of the spinous processes. This dis-alinement is not apparent to sight but is perfectly apparent to touch, and is due to the fact that in the majority of compression fractures, the impact of the bodies is not a central one, and rotation of the spine at the site of fracture results. Therefore, below the site of fracture the palpable tips of the spinous processes will be in a line which is broken at the site of fracture, and the spinous processes at this site sharply deviate to one side or the other, not a great distance but a distance great enough to be readily apparent. If in addition to the compression there is dislocation, a variation from the normal in the depth of the spinous process may be apparent.

Localized tenderness over one or two spinous processes will invariably be discovered when examining for dis-alinement of the spinous processes, and the point of most acute tenderness in the cases in this small series coincided with the deviated processes. In cases of fracture of the transverse processes of the lumbar vertebrae the point of tenderness is lateral to the spinous processes. So important is localized tenderness over the spinous processes, or just lateral to them in the lumbar region, that where this sign is found, fracture of the spine should always be suspected until it can be positively disproved by x-ray.

Protective spasm of the erector spinae muscles was very marked in the cases of fracture of the transverse processes, but was very slight or absent in fully half of the cases of compression fracture. The presence of spasm, therefore, should suggest the possibility of fracture of the spine, but its absence does not exclude this condition as the cause of the patient's back pain.

Motions of the back are limited and accompanied by pain and the back is stiff, but the limitation of motion and the stiffness are no more marked than in many cases of hypertrophic arthritis.

The final proof of the presence of fracture of the spine must be determined by x-ray. But not only are satisfactory plates difficult to obtain but their interpretation is very difficult. The callus formation about a fracture gives shadows identical with hypertrophic changes. In fact the first reports in several of this series read "hypertrophic changes," and fracture was demonstrated only after repeated trials, and might then have been overlooked had not lateral views of the spine been taken. Lateral views show unmistakable deformity of the vertebral bodies that clinch the diagnosis, and should be taken in every suspected case of spinal fracture. Except in the mid-dorsal region where the scapulae are interposed, and the low lumbar region, where in like manner the iliac alae are interposed, very satisfactory lateral views have been obtained.

The importance of the recognition of ambulatory fractures of the spine and the institution of proper treatment can not be too much emphasized. The suffering of the patient is great, but in a certain number of cases, if prolonged fixation is not given the spine, the knuckle increases. And, as in fractures of the long bones, callus formation is greater in those instances when the fracture has not been completely immobilized, it is fair to assume that callus formation in fractures of the spine is greater if the fractured site is not supported. In both instances, from increasing kyphos and exuberant callus formation, the spinal cord or spinal nerves are exposed to the danger of compression. And medullary compression may mean complete invalidism.

Treatment may be either conservative or radical. In the former case, the application of plaster jackets with the patients in slight extension is advocated; in the latter instance permanent splinting of the spine by an Albee operation, or one of its modifications, suggests itself as a rational and possibly desirable procedure.

All patients in the present series were treated by supports for their backs which were applied by members of the orthopedic staff of the Hospital. In only one instance was operation advised, and in that case it was because plaster jackets failed to relieve the pain. One patient who has worn a plaster jacket for five months is now having difficulty in emptying his bladder in that he can get the stream started only by prolonged effort. A careful examination of his urinary tract fails to reveal any lesion, and the suggestion offers that his symptoms are due to medullary compression by callus. Here again the query arises: could this complication have been avoided by an early operation?

This series of cases is too small and the time which has elapsed is too short to make an answer to this question. But certain is the fact that if fixation is the method chosen, such fixation must be employed for at

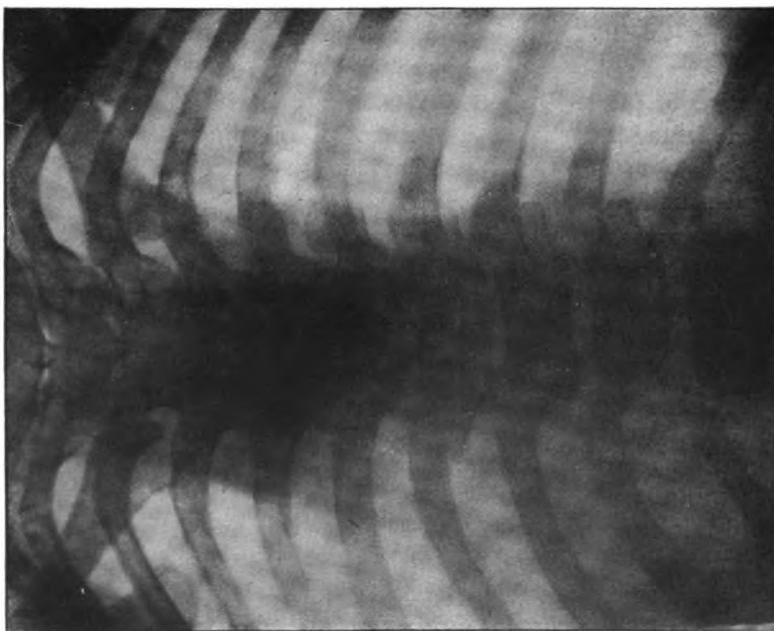


FIG. 1. (Case 2) Antero-posterior views, compression fracture sixth dorsal vertebra. Note obliteration of intervertebral spaces above and below the fractured body. Manubrium shadow increases difficulty of interpreting conditions of bodies behind it.

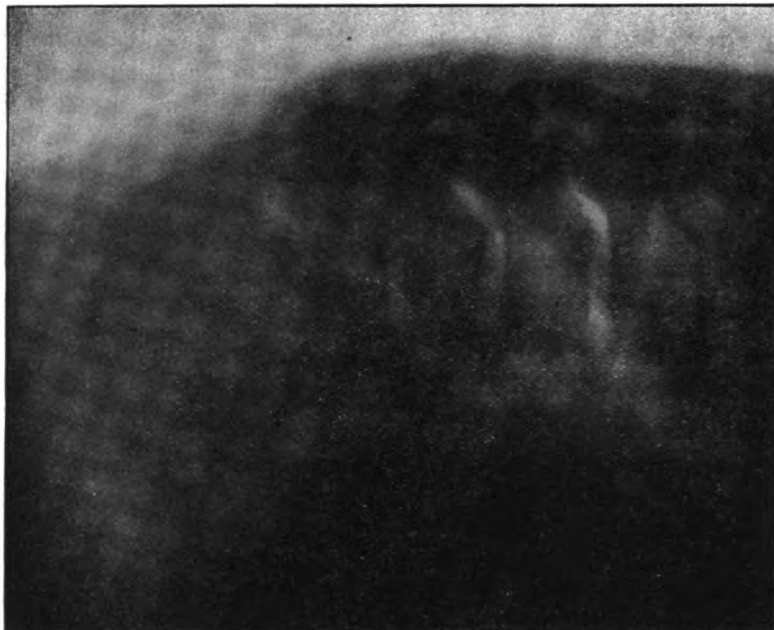


FIG. 2. (Case 2) Lateral views of same case as Fig. 1. The changed outline of the bodies of the fourth and fifth vertebrae from the bottom, in which the anterior depth is not more than two-thirds the depth of the body behind, makes the diagnosis of compression fracture certain.

least six months, and when the plaster jackets are omitted, a firm back brace should be substituted.

If the pain is not relieved by the plaster jackets or if there is an increase in the knuckle, it is the belief of the writer that a splinting of the spine by bone grafting is distinctly indicated.

**SUMMARY:** Fractures of the vertebral bodies and lumbar transverse processes are not infrequent injuries but are generally overlooked.

These fractures cause steady pain in the back but need not be accompanied by any neurological symptoms.

Localized tenderness over the spinous processes should always suggest the possibility of fracture of the spine, and if in addition to localized tenderness there is a dis-alinement of the spinous processes, the diagnosis is almost certain.

The kyphos caused by compression fractures may readily be mistaken for the deformity of a bad posture.

Treatment should consist in prolonged fixation of the spine in extension by plaster jackets or permanent splinting of the spine by a bone grafting operation.

#### SUMMARY OF CASES.

**CASE 1.** O. P. D., 257,288. Male, aged 24. Carpenter. First seen December 9, 1914, on account of pain in lumbar region following a fall from a ladder a month before. First aid had been given by adhesive plaster strapping but failed to relieve. Back pains alike when walking or lying down.

**EXAMINATION** of the back showed a flattened lumbar curve with marked spasm of the erector spinae group of muscles. Practically no motion in the lumbar spine was present, owing to the pain. Flexion of the pelvis on the spine also caused pain. X-rays showed hypertrophic changes in dorsolumbar region.

**TREATMENT:** Plaster jacket was applied and worn without relief of pain until January 20, 1915, when he was referred for Zander treatment. This treatment likewise did not relieve the pain and March 15, 1915, his back was manipulated under ether and adhesive plaster strapping applied. April 1, 1915, the x-ray showed distinct crush of first lumbar vertebra. The patient was again put in plaster but pain was so little relieved that operation was advised, but not accepted by the patient.

**PRESENT CONDITION:** August 12, 1915, he was still wearing a jacket and still complaining of back pain.

**CASE 2.** O. P. D., 236,649. Schoolboy of 15. February 8, 1914, fell from a shute in a public play ground and was picked up unconscious



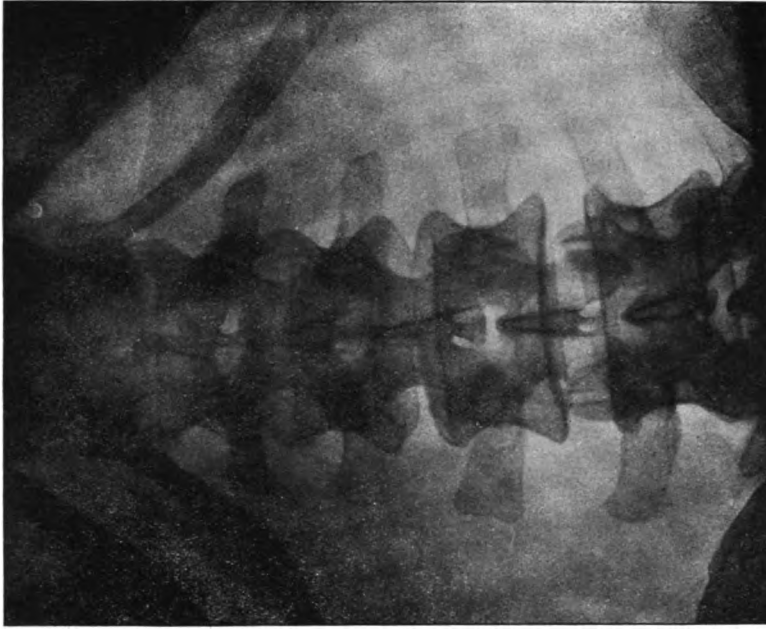


FIG. 4. (Case 5) Fracture of transverse process of first lumbar vertebra (right).

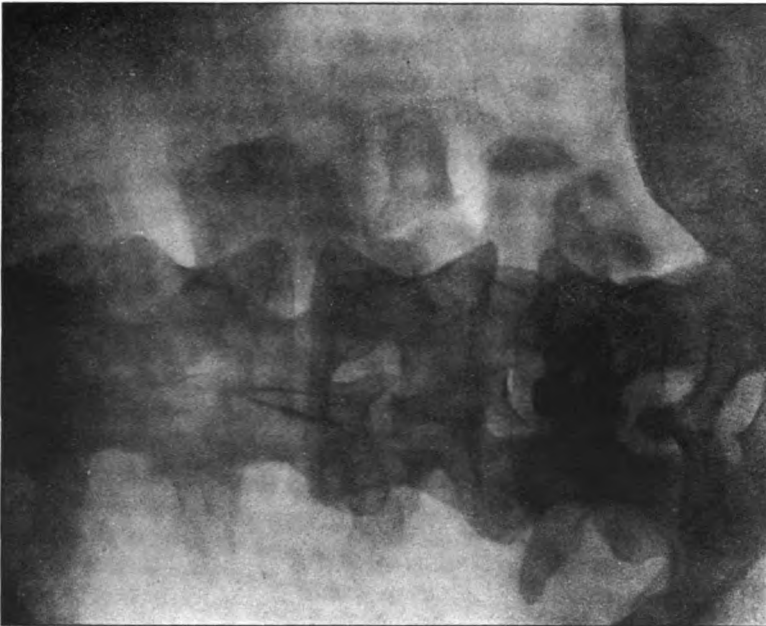


FIG. 3. (Case 4) Fracture with displacement of transverse process of third and fourth lumbar vertebrae. Reproduction shows only the fracture of the fourth clearly.

and taken to a hospital. On arrival he had regained consciousness and was complaining of pain in his back. Examination at this time revealed a fracture of the skull in right fronto-parietal region, but with no signs of paralysis or change from normal in the reflexes. X-rays were taken of the spine but reported negative. In ten days he was discharged from the hospital.

March 20, 1914, he reported first to the out-patient department complaining of headache and sharp shooting pains in his back. With the history of head injury and the presence of inequality of the pupils, all attention was directed to the head.

February 24, 1915, he again reported to the out-patient complaining of constant backache between the shoulders, and that his back tired so easily that he could not indulge in boys' sports.

**EXAMINATION.** A markedly round shouldered boy. Marked tenderness over the spinous processes of the fifth and sixth dorsal vertebrae. X-rays showed fracture in the mid-dorsal spine. The antero-posterior view was suggestive (Fig. 1) but the pie-shaped vertebral bodies shown in the lateral views (Fig. 2) confirmed the diagnosis.

**TREATMENT.** A steel back brace was fitted by the surgeons in the orthopedic department.

**CASE 3.** O. P. D., 178,359. A gardener 59 years old. First seen April 1, 1915, a week after a fall from a tree onto his head. "The balance of the body seemed twisted over, and he seemed to hear something give away," was momentarily stunned, but walked to the house though his legs were a bit shaky and he was in a cold sweat. He complains of pain in the back between the shoulders, increased by coughing.

**EXAMINATION** showed an apparently very round shouldered man with marked tenderness over the fourth dorsal spine. The third dorsal spine seems deeper than the others. Motions of the back limited in all directions but head motions free. No muscle spasm present. No disturbances of motion or sensation and reflexes normal. X-ray shows "compression fracture of fourth dorsal vertebra."

**TREATMENT.** He was referred to the orthopedic department for application of a jacket or fitting of a back brace.

**CASE 4.** O. P. D., 265,566. Freight brakeman 32 years old. February 8, 1915, he was squeezed between a freight car and a wall. He was taken to a hospital where he remained a month and a half for treatment of fractured pelvis.

April 2, 1915, he first came to the out-patient department complaining of pain in the mid-lumbar region, and over right sacro-iliac joint.

**EXAMINATION.** Walks very stiff-legged and guardedly. Lumbar curve considerably flattened and there is marked limitation of motion in

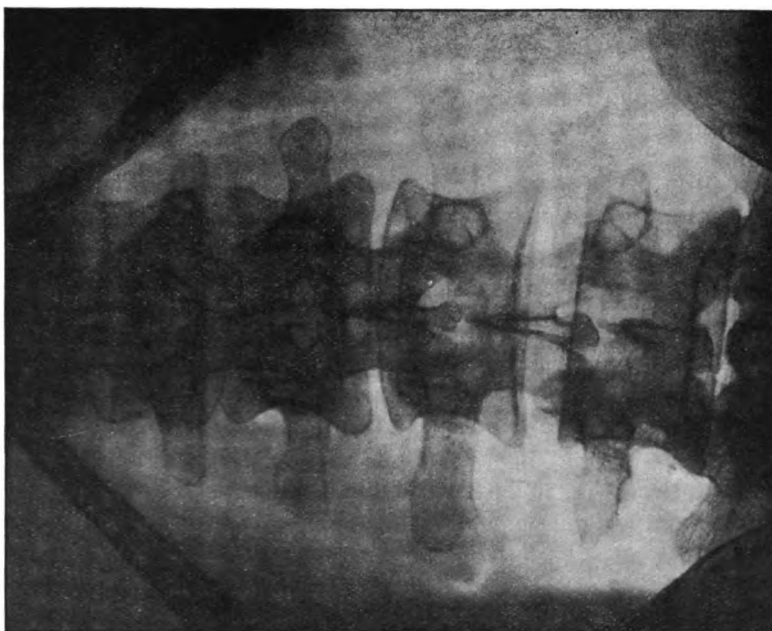


FIG. 10. (Case 11) Note lipping on right upper surface of body of first lumbar; Spinous process of twelfth dorsal lies to the left of the line of those of the vertebrae below. Line of fracture in transverse process to left of fourth lumbar.

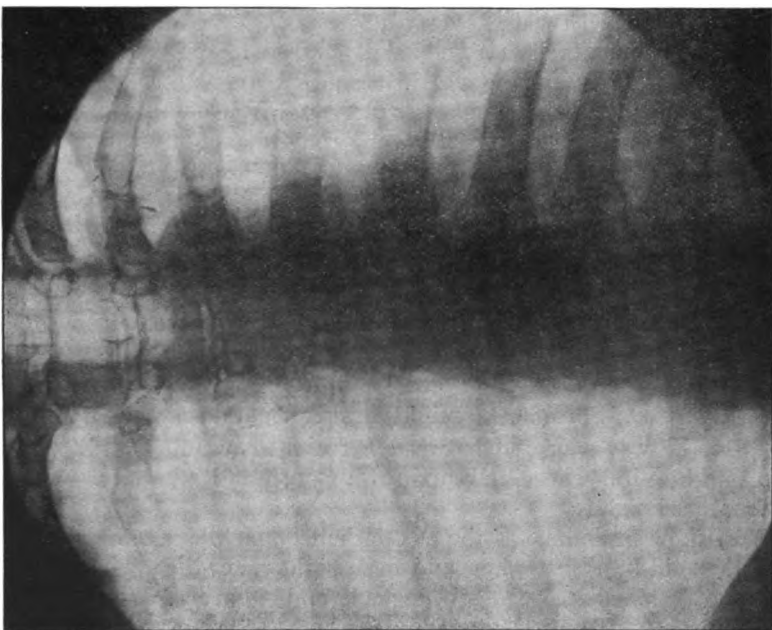


FIG. 5. (Case 6) Compression fracture fourth dorsal vertebra. Displacement of spinous processes above site of fracture very evident. Difficulty of making a positive diagnosis of fracture from antero-posterior view alone well illustrated by this plate. Interposition of mandibulum increases this difficulty.

all directions in the low lumbar region. Marked tenderness present on pressure just to the right of the midline opposite the spinous process of the third lumbar vertebra. No dis-alinement of the spinous processes present. X-ray shows fracture with displacement of the right transverse processes of the third and fourth lumbar vertebrae (Fig. 3).

**TREATMENT.** He was referred to the orthopedic department where a leather jacket was fitted with marked relief of pain.

**CASE 5.** O. P. D., 57,967. Carpenter, 44 years. First seen April 20, 1914, four days after falling from a chair in which he intended to sit, and striking his back on a cuspidor. Complains of pain in upper lumbar region.

**EXAMINATION** reveals marked muscle spasm of the erector spinae muscles on the right. Posture good. No dis-alinement of the spinous processes, but marked tenderness to the right of the spinous processes of first lumbar vertebra. All motions of the back are painful but not limited in extent. X-ray shows fracture of right transverse process of first lumbar vertebra without displacement (Fig. 4).

**TREATMENT.** He was referred to the orthopedic department where back was strapped with adhesive plaster. A week later had pain only on lateral movement of the spine.

**CASE 6.** O. P. D., 267,738. Pick and shovel laborer, 26 years old. April 18, 1915, was struck on right shoulder and back by a steam shovel. Was taken to a hospital where diagnosis "contusion of back" was made.

**Examination** was negative. There was no paralysis, reflexes all normal and x-rays were negative. He remained in the hospital two days.

April 27, 1915, first visited the out-patient department where examination revealed an inconspicuous knuckle with marked tenderness on pressure over fifth dorsal, which was distinctly displaced to the left of the mid-line as were the spines above it, though to a less degree. Back is stiff with pain on motion referred to the site of the kyphos. X-rays showed fracture of fourth dorsal vertebra (Fig. 5).

**TREATMENT.** The orthopedic surgeons applied a plaster jacket at once, which was worn three months with considerable though not complete relief of pain. The middle of July 1915, a steel back brace replaced the plaster jacket.

**CASE 7.** O. P. D., 267,948. A Jewish peddler of 45. First reported to out-patient department April 30, 1915, and stated that three months previously the wagon which he was driving was struck by a train and he was thrown out, but the train did not hit him. Went home without assistance, but was in bed five weeks on account of pain in his back. No bones were said to have been broken. Now complains of continuous

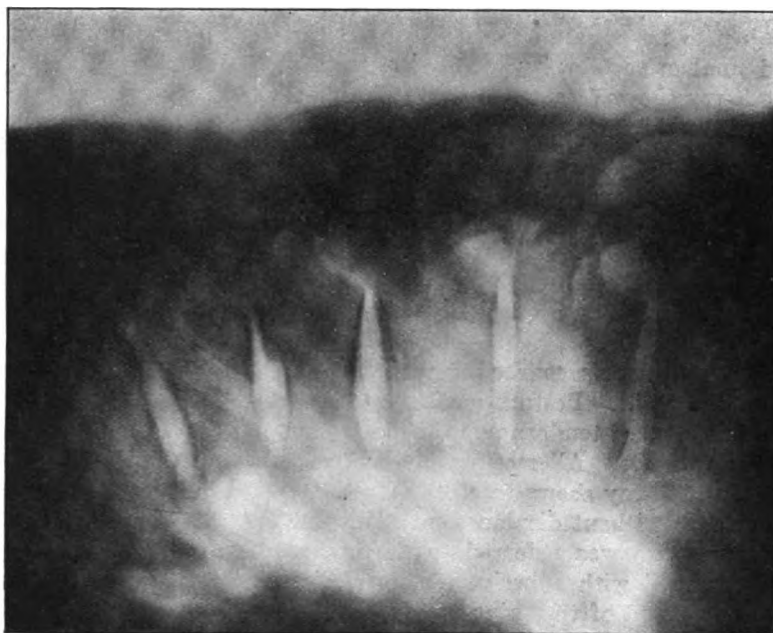


FIG. 7. (Case 7) Lateral view of Fig. 6. Distorted bodies of two vertebrae (eighth and ninth dorsal) very evident.

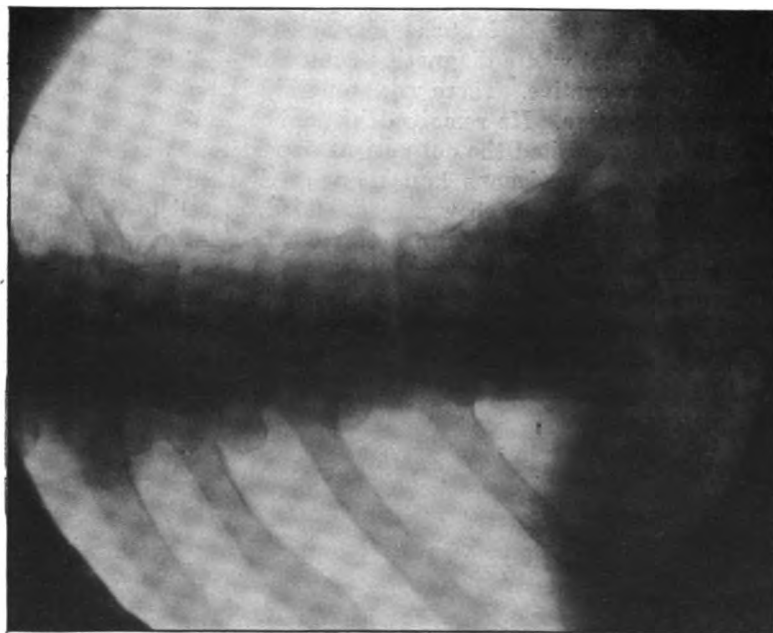


FIG. 6. (Case 7) Compression fracture ninth dorsal vertebra. Lessening of height of fractured body as compared with that of vertebra above and below evident. Difference in height of vertebra on left and right very evident. Disalignment of spinous processes not marked.

pain in low dorsal region, and over left side of chest when he takes a deep breath.

**EXAMINATION** shows rigidity of low dorsal and lumbar spines without muscle spasm. Lumbar curve somewhat flattened. No kyphos but marked tenderness over tenth dorsal spine which deviates slightly to the left. All motions of back limited and painful. Reflexes normal. X-ray shows fracture of ninth dorsal vertebra (Figs. 6 and 7).

**TREATMENT.** The orthopedists applied a plaster jacket, which was worn a month when a steel back brace was substituted. August 10, 1915, reports that he still has pain in his back, off and on. Examination shows that back motions are "very slightly limited." October 14, 1915, he comes to the out-patient department because of difficulty in starting urinary stream. Consultation was held with urologists and neurologists but nothing found to account for the symptoms.

**REMARKS.** The probability of cord compression by callus is unquestioned, and the query suggests: if longer firm support in plaster had been used, or if spine had been splinted by bone graft, might not this complication have been avoided?

**CASE 8.** O. P. D., 135,216. Brakeman of 45 years. March 23, 1915, was knocked over by a slowly moving locomotive and the locomotive except the fire box passed over him. He was at no time unconscious. Was taken to a hospital after his injury where he stayed for three weeks for treatment for fractures of ribs and right clavicle and multiple abrasions. Save for tenderness in mid-dorsal region, examination of his back was negative. His reflexes were normal. The only treatment given his back was strapping with adhesive plaster.

May 3, 1915, he applied to the out-patient department for treatment for pain in the back. Pain dates from accident. Pain is steady but exaggerated when rising from a sitting position. Has had no sensory or motor palsy and no sphincteric difficulties.

**EXAMINATION** shows a definite kyphos with apex at eleventh dorsal spine where there is extreme tenderness on pressure. Lumbar curve considerably flattened. Left side of chest more prominent than right. Reflexes normal. X-ray shows compression fracture of twelfth dorsal vertebra.

**TREATMENT.** Plaster jacket applied in the orthopedic department, which was worn till the latter part of July, when a leather jacket was fitted. Pain was not completely relieved by apparatus but was always worst when rising from a sitting position to his feet.

**CASE 9.** O. P. D., 271,365. Italian pick and shovel laborer of 26 years. First applied for treatment in the medical side of the out-patient department June 9, 1915, where he stated that on May 17, 1915, he was

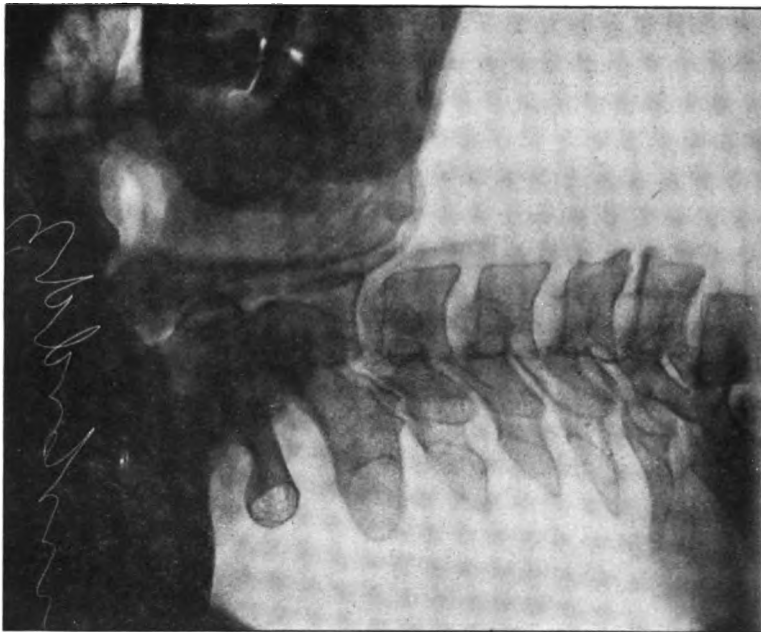


FIG. 9. (Case 9) Lateral view of Fig. 8. Compression and distortion of body of fifth cervical plain; also forward dislocation of sixth and fifth cervical on seventh.



FIG. 8. (Case 9) Fracture dislocation fifth cervical vertebra. Indistinctness of fifth cervical shadow as compared with those of vertebra above and below. Disalignment of spinous processes at site of fracture plain.

hit by a falling plank, which crushed his ear. Since his accident he has had pain in the back of his neck, which is "the same, no matter how he sits or lies."

June 14, 1915, he was transferred to the surgical department where examination showed a man who held his neck very stiffly. Flexion was limited one-half and extension possible through only a few degrees. Rotation to left normal; to the right very limited. Muscle spasm present of the muscles lateral to the spinous processes. Marked tenderness to pressure over sixth cervical spine, which is definitely to the left of the general line of spinous processes. No pharyngeal examination. Reflexes normal. X-rays show fracture with some displacement of the fifth and sixth cervical vertebrae (Figs. 8 and 9).

**TREATMENT.** A Thomas collar was fitted by the orthopedic surgeons which was worn till the middle of August, when he was noted to be free from pain and range of movement of the neck had improved.

**CASE 10.** O. P. D., 271,838. Irish pick and shovel laborer of 40 years. June 14, 1915, came to the out-patient department with the story of having fallen from a height, striking on concrete walk. Complains of great pain in low dorsal region. Can stand or walk with moderate comfort but can not lie comfortably in bed nor bend over.

**EXAMINATION** shows man with shoulders thrown forward, and low dorsal region bows backward somewhat. No definite knuckle. Back stiff and movements in every direction painful and limited. Considerable muscle spasm. Abrasions present over spinous processes of eleventh and twelfth dorsal and first lumbar vertebra. Marked tenderness to pressure present over twelfth dorsal spine and spines of both eleventh and twelfth lie to the right of the midline. X-ray shows compression fracture of twelfth dorsal vertebra.

**TREATMENT.** Plaster jacket was applied in the orthopedic department but in spite of this he is noted on July 21, 1915, as developing a kyphosis with the twelfth dorsal as the summit. New jacket was applied and patient was still wearing it the middle of November when there had been no increase noted in the knuckle and no sign of cord pressure had developed.

**NOTE.** If the spine had been splinted by bone graft the development of the kyphos would probably have been avoided.

**CASE 11.** O. P. D., 82,086. Painter of 34 years. July 10, 1915, reported to the out-patient department with a history of having fallen 30 feet from a broken staging onto his back April 28, 1915. Water was bloody for a few days, and he claims to have broken two ribs by his fall. Now complains of pain and weakness in his back. Is at work but quickly



tires and his efficiency is diminished by being unable to lift anything because of pain.

**EXAMINATION.** Curve of back normal. No spasm of muscles. Motions free but painful. Marked tenderness over spine of first lumbar vertebra which deviates to left from midline slightly. Reflexes normal. X-ray shows fracture of body of first lumbar and left transverse process of the fourth lumbar vertebra (Fig. 10).

**TREATMENT.** An anterior and posterior brace was made and fitted in the orthopedic department, which has been steadily worn. September 12, 1915, the patient reported steadily increasing relief from symptoms.

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## AN OVERLAPPING JOINT AS A SUBSTITUTE FOR CUNEIFORM OSTEOTOMY.

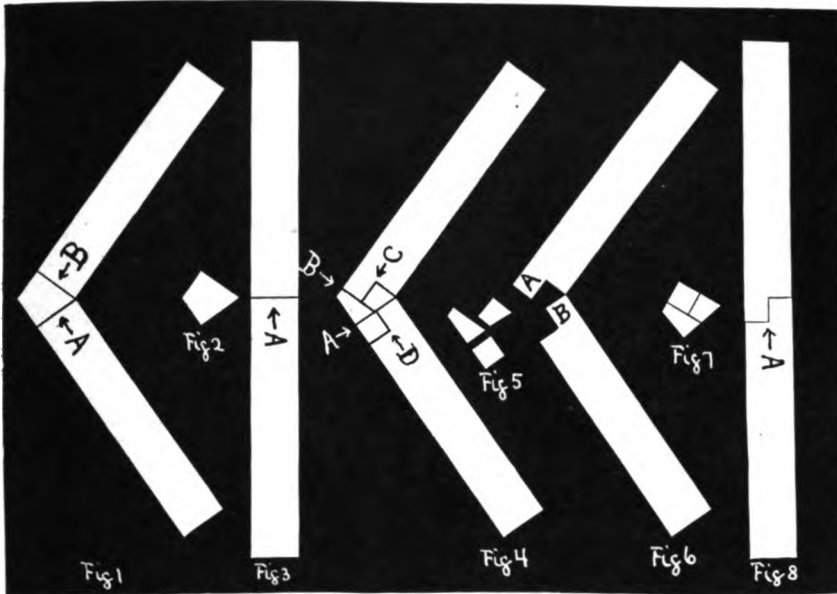
BY PHIL. HOFFMANN, M.D., ST. LOUIS, MO.

ONE should not resort to removal of bone when a deformed limb can be straightened by simple linear osteotomy. There are, however, many cases of deformity in which the angularity is too great to permit safely straightening by simple section, and in these it is the custom to perform a cuneiform osteotomy, in which the cuts are made perpendicular to the long axes of the two arms of the bent bone and meet at the apex of the angle on its concave side, if one would have the bone completely straight when the cut surfaces are brought into apposition (Figs. 1, 2 and 3).

The writer has devised an operation that substitutes for the simple transverse joint made in the cuneiform section, an overlapping one that is less liable to displacement. This overlapping joint, with its attendant greater security, is obtained by removing exactly the same amount of bone as would be required in a cuneiform osteotomy (Figs. 4, 5, 6, 7 and 8).

A deformed joint with bony ankylosis can be treated as a single bone when firm union in a straight position is desired.

Originally the writer used in each case a tracing of a radiograph of the deformed bone on which to plan the lines of section. Later he found that a simple general plan that involved two linear cuts and the removal



- FIG. 1.—Cuneiform osteotomy, showing lines of section at A and B.  
 FIG. 2.—Wedge removed in cuneiform osteotomy.  
 FIG. 3.—Bone straightened after cuneiform osteotomy, showing transverse joint at A.  
 FIG. 4.—New Operation, showing lines of section at A, B, C, D.  
 FIG. 5.—Fragments removed in new operation.  
 FIG. 6.—Shape of bone ends after removal of fragments.  
 FIG. 7.—Rearrangement of removed fragments. Note that combined they correspond exactly in size and shape to the wedge shown in Fig. 2.  
 FIG. 8.—Bone straightened after new operation, showing overlapping joint at A. Note that the length of the bone is exactly the same as in Fig. 3.

of two corners of bone could be applied to all cases, no matter what the degree of angularity, and that the operation required no radiograph tracings or previous study of the individual case, but that, by following general principles, it could, like any other osteotomy, be done accurately in a case seen for the first time.

The first cut (Fig. 4, A) is made exactly as the first cut in a cuneiform osteotomy (Fig. 1, A); that is, perpendicular to the long axis of one of the arms of the deformed bone, on a level with the apex of the angle on the concave side of the bend. This divides the bone into a longer and a shorter segment.

The second cut (Fig. 4, B) is made perpendicular to the long axis of the longer segment, on a plane parallel with, but distal to, the cut that would have been made in a cuneiform osteotomy (Fig. 1, B). The more distal this plane, the longer will be the overlapping tongue of the resulting joint.



FIG. 9.—Bony ankylosis of knee in acute flexion. Scars are result of suppuration nine years before.

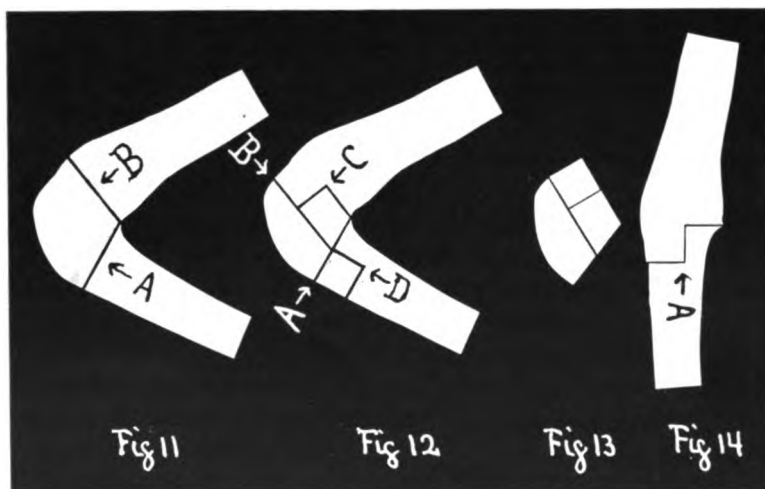


FIG. 11.—Tracing of radiograph, Fig. 10, showing cuts, A and B, that would have been necessary for a cuneiform osteotomy, and the resulting wedge fragment.

FIG. 12.—Tracing of radiograph, Fig. 10, showing cuts, A, B, C, D, actually made in the writer's operation and the resulting fragments removed.

FIG. 13.—Rearrangement of removed fragments. Note that combined they correspond in size and shape to the wedge shown in Fig. 11.

FIG. 14.—Bone straightened after operation, showing overlapping joint at A.

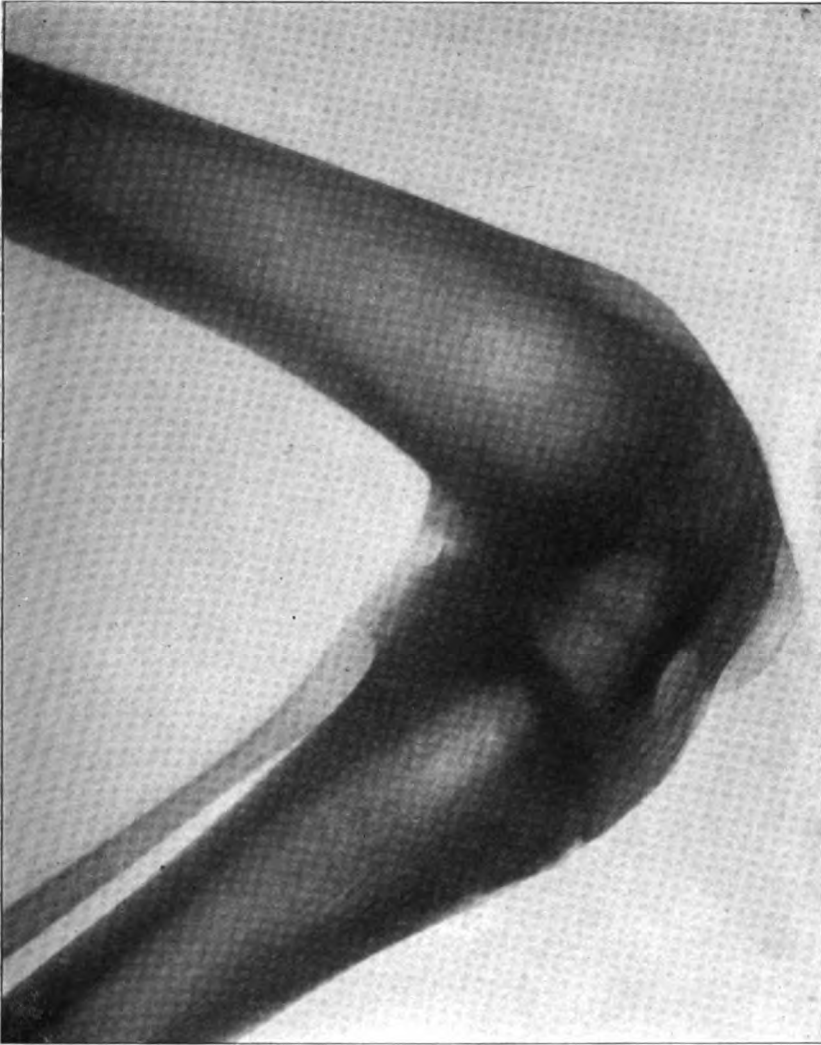


FIG. 10.—Radiograph of knee shown in Fig. 9.

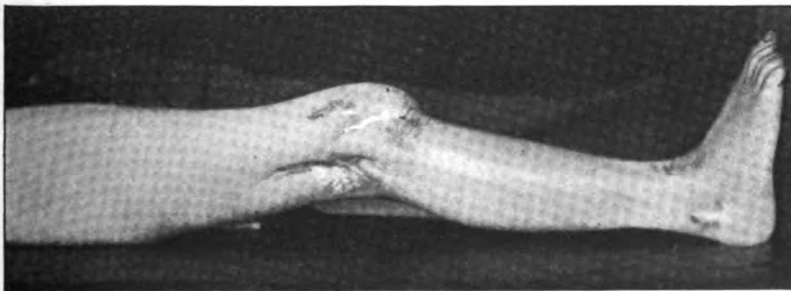


FIG. 15.—Straightened knee after operation. Faint linear scar behind and below patella shows line of incision. Large deep scars are due to old suppuration.



**FIG. 16.**—Radiograph taken three months after operation, showing fused overlapping joint.



**FIG. 17.**—Photograph of actual bone fragments removed, rearranged to form a wedge.

Next, the end of the longer segment is turned out through the skin incision, and a corner is removed from its deeper side (Fig. 4, C). In removing this corner the longitudinal cut should be parallel to the long axis of the segment and divide the bone equally; the transverse cut should be on a level with what was the apex of the angle on the concave side of the deformity. This leaves a projecting tongue, half the thickness of the bone, on the superficial side of the end of the longer segment (Fig. 6, A).

Next a corner is cut from the superficial side of the end of the shorter segment (Fig. 4, D). This leaves a tongue projecting from the end on its deep side (Fig. 6, B). This corner should fit the tongue, projecting from the end of the longer segment.

The fragments removed are shown in Fig. 5, and the resulting shape of the ends of the bone segments is shown in Fig. 6.

The rearrangement of the removed fragments illustrated in Fig. 7, shows that combined they correspond in size and shape with the wedge removed in cuneiform osteotomy, as illustrated in Fig. 2.

Fig. 8 shows the overlapping joint at A after the bone has been straightened. It will be seen that the length of the bone is exactly the same as after cuneiform osteotomy (Fig. 3).

No bone suture is necessary. The soft tissues on the concave side of the deformity act as a stay by being made taut when the bone is straightened, and this, with the overlapping of the bone ends, gives sufficient security.

While at first glance the several necessary cuts appear complicated, they really become very simple when one understands their underlying principle. The writer has made them all with an ordinary flat saw.

In closing, it may be well to illustrate with one case from practice.

Fig. 9 is a photograph of a knee ankylosed in acute flexion, and Fig. 10 a radiograph of it. Figs. 11 and 12 are cardboard patterns of tracings of the radiograph. Fig. 11 shows the cuts that would have been necessary for a cuneiform osteotomy, and the resulting wedge removed. Fig. 12 shows the cuts actually made in the writer's operation and the resulting fragments removed. Fig. 13 illustrates a rearrangement of the fragments, and shows that combined they correspond in size and shape to the wedge shown in Fig. 11. Fig. 14 shows the bone straightened. Fig. 15 is a photograph of the straightened knee. Fig. 16 is a radiograph of it, taken three months after operation, showing the fused overlapping joint. Fig. 17 is a photograph of the actual bone fragments rearranged to form a wedge.

## REPORT OF A CASE OF DEPOSIT IN THE SUPRASPINATUS MUSCLE SIMULATING SUB-ACROMIAL BURSITIS.

BY JOHN DUNLOP, WASHINGTON, D. C.

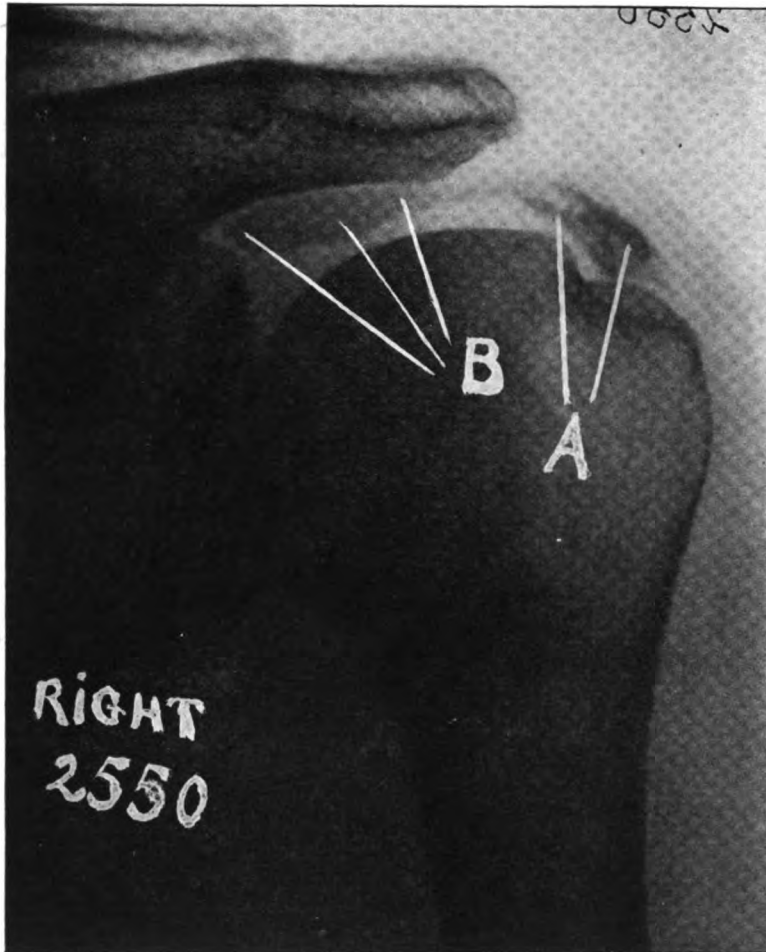
SINCE my attention was first called to the subject of stiff and painful shoulders by the papers of Dr. Codman, and a later one by Dr. Goldthwait, it has been my fortune to see a large number of cases of shoulder disability. As is so often the case, when we become interested in a condition which has recently been brought to our attention, I felt that all of these cases represented one of the types described in the papers just mentioned. It was not long, however, before they began to show, through close observation during their course, that in a fairly large percentage I was dealing with something other than the simple cases described by Dr. Codman. One very marked example which I have taken care of this year has led me to bring this subject to your attention. No doubt many of you have had a similar experience, but I believe a reiteration of such an experience would be helpful.

Before I had ever heard of sub-deltoid bursitis as described by Dr. Codman in his first paper, I saw, with Dr. Painter, the case that he reported, with a peculiar deposit at the point of the shoulder. This was at least a year before Dr. Codman's first publication. Later, Dr. Brickner reported a case of deposit in the sub-deltoid bursa. Dr. Codman refers to both of these papers and reports several cases of his own, all of which were supposed to be deposits in the sub-deltoid or sub-acromial bursa. It was only last year, as you will remember, that Dr. Ely reported, with some detail, a case of sub-acromial bursitis, with the production of lime in the bursa. I had had a number of cases showing a shadow in the x-ray examination which I took to be either a deposit in the bursa, or a thickening of the torn portion of the tendon, and it was not until the ninth of December, 1914, when I heard Dr. Walter M. Brickner, of New York, read a paper on shoulder disability at our local society in Washington, that I appreciated the correct pathology of these cases with deposit. Dr. Brickner's paper has since been published in the March number of the *American Journal of Medical Sciences*. He brought out very forcibly the fact that the deposit was not in the sub-acromial bursa, but was located beneath it, in the sheath or body of the tendon of the supraspinatus muscle, or other tendons of the shoulder group of muscles. He had at that time operated on six such cases, and

has been able to demonstrate positively to his own mind, that the deposit was, in such cases, located within the sheath of the tendon of one or another of these muscles. So far as I know, he was the first to make such a statement, all previous observers having stated that the deposit was within the bursa. On the following day, December 10, I was called in consultation to see a shoulder case and, peculiarly enough, by one who had not heard Dr. Brickner the previous evening.

The patient had first noticed the trouble with his shoulder exactly one week prior to this consultation. The pain had come on suddenly in the evening and was excruciating in character. The patient was controlled only by large quantities of morphine hypodermically. He was confined to his bed until the following Monday, when, compelled by stress of business to appear before one of the Congressional committees, he was able, with considerable difficulty, to make a trip to the capitol. The pain had subsided considerably since the onset, although the patient was under the influence of large quantities of salicylates, which may have been accountable for the temporary subsidence of the symptoms. By Wednesday night, the evening I saw him, the pain had returned, even much more severely than the original onset, and during the night could not be controlled, although he obtained about one grain of morphine in the course of the night. I saw him early the following morning. His expression was that of great suffering, and any attempt at an examination of the shoulder was attended by great fear. The arm was held tightly to the side, and he screamed with any attempt at motion. An x-ray examination was immediately made, and to my surprise, showed in a stereoscopic view a large deposit about the tendon of the supraspinatus, as well as a considerable deposit in the belly of the muscle, showing well back under the acromion process. In this stereoscopic view, it was perfectly easy to demonstrate how the deposit lay around the tendon. An operation was advised, but was emphatically refused. There seemed to be nothing to be done other than to follow out the conservative method of treatment, and I decided that the pain was probably due to the tension of the supraspinatus muscle, and therefore decided to put it at rest in the abducted position. On account of the extreme degree of voluntary spasm, it was necessary to give nitrous oxide anesthesia to obtain the position, and then a plaster-of-Paris cast was applied, such as is used in the abducted position for fracture of the neck of the humerus. Following this procedure, the patient became fairly comfortable within a few hours, but there remained a great deal of soreness at the point of the shoulder. After ten days the cast was removed and motion was started, which, however, seemed to stir up the condition and produce pain similar to the acute attack, and it was decided to go quite slowly in the letting up on the support and position.





- A. Shows the deposit as it lies on the surface of the tendon of the supraspinatus muscle near its attachment into the greater tuberosity of the humerus.
- B. Shows the deposit in or about the belly of the supraspinatus muscle as it lies under the acromial process.

I might say, at this point, that the advice of about every physician the family knew, more especially in New York, was obtained, and all had advised against operation. Singularly enough, just as the shoulder had become fairly quiet, and just two months after I had first seen it, the patient began to have trouble with the left shoulder, the most prominent symptom being Dawbarn's sign. A radiographic examination showed a similar condition to the right shoulder, though not so extensive. Being taken promptly in hand, the symptoms did not be-

come alarmingly severe, and fixation of the shoulder to the side in a plaster shell, so as more rapidly to obtain fixation when the patient was lying down, gave complete relief. At this point, I was very much disturbed as to the procedure in the conduct of the case and decided that, if possible, something should be done to stimulate absorption, or to help the tissues to accommodate themselves to this deposit, and a regular treatment of hot air baking was instituted. This unquestionably helped to relieve the pain and quickened the return to normal motion. During the entire course the patient ran a little temperature, fluctuating to 100.4°.

I forgot to say that there is a history of gout in the family, and that he himself has large plaques in the ears, which did not in any way resemble tophi, and which he said he had had ever since he could remember as a child. It is also of interest in the history of the case that since he was a young man, when he once strained his arm in throwing a ball, he has had, at long intervals, a sharp pain in the right shoulder, following strenuous golf or tennis, which, however, would last but an hour or so at the longest. It would be interesting to know whether the deposits in this case are of long standing, for Dr. Brickner stated that he thought the deposits were only of a few days' duration.

This case proved to me Dr. Brickner's contentions as to the location of the deposit, and I believe that with good stereoscopic radiograms we can be quite sure of the location of such deposits in all such cases. This case, further, is of interest in that it has become practically symptomless without the removal of the deposit, although this course was not of my choice. But it is instructive that, following Dr. Bricker's positive statement that all such cases should be operated and all deposits removed, they can get well without such a proceeding. This experience stimulated me to make a careful study of the x-rays of my entire series of cases, and I will show a few slides of some of the odd types which I have encountered, all of which seem to produce symptoms which might be classified under one of the heads Dr. Codman so graphically describes.

The cases of spur formation are of especial interest to me as requiring a much more prolonged and careful supervision, but which can with such care be made symptomless and the function of the shoulder restored. For instance, one of these cases was that of a shoemaker who has returned to his trade and is now steadily at work.

It is not with the intention of discrediting in any way the wonderful work of Dr. Codman that I call attention to these cases, but with the appreciation that in addition to what he has given us, we run across these odd conditions, which we must be able to differentiate and treat accordingly.

# Orthopedic Society Meetings

NEW YORK ACADEMY OF MEDICINE, ORTHOPEDIC SECTION.  
JANUARY 21, 1916.

1. Presentation of cases.
  2. Papers.
    - a. "A Method of Stretching Flexed Knees to Prevent Posterior Subluxation." C. H. JAEGER, M.D.
    - b. "Remarks on the Occurrence of Rachitic Deformities in Adolescents and Adults." R. H. SAYRE, M.D.
- WILLIAM FRIEDER, M.D., *Secretary*.

## INTERURBAN ORTHOPEDIC CLUB.

BOSTON, DECEMBER 30-31, 1915.

The Interurban Orthopedic Club held its Sixteenth meeting in Boston on December 30 and 31, 1915. The complete program was printed in the January issue.

The first morning session was held at the Massachusetts General Hospital. Dr. Brackett repaired a torn crucial ligament in the knee-joint, showing the method of approach by splitting the patella, median incision. Dr. John Dane discussed the subject of "Osteopathic Manipulations" demonstrating these on a patient with a subluxation of the sacro-iliac joint. Dr. Danforth demonstrated the work being done on structural lateral curvature, and said it was not possible to overcorrect a curve, although he did believe that it was possible to help the condition by forcible correction. Dr. Osgood showed various operative cases which were considered failures, discussing the reasons for such. Dr. Hall demonstrated the work being done on club-feet, showing excellent results by the gradual correction by plaster of Paris as opposed to operative results. Dr. Bucholz showed cases of spastic paraplegia, in which the Staffel operation of partial nerve resection was employed with distinct improvement.

The afternoon session was held at the Harvard Medical School. Drs. Forbes and Miller gave experimental evidence that etherization gives peripheral as well as central anaesthesia which may refute the principles of nerve block as practised by Crile. Dr. Folin showed that the quantitative estimation of uric acid in the blood was not reliable, which has a bearing on work being done on gout. Dr. Osgood showed lantern slides to illustrate the use of orthopedic appliances in the treatment of gun-shot wounds as carried out in the American Ambulance in France. Dr. Cotton showed that bone repair depends on the presence of live bone and adequate fixation. The active cells may be either endosteal or periosteal. He believes that the success of bone graft is in a larger part due to the mechanical fixation furnished by the graft. The talk was illustrated by lantern slides. Dr. Goldthwait spoke of cases of pain in the dorso-lumbar region being due to the catching of the twelfth rib on the tip of the transverse process of the first lumbar. Dr. Greenough showed lantern slides to illustrate some of the types of bone injury as seen in France.

Friday morning was spent at the Children's Hospital. Dr. Lovett showed a case of partial absorption of the head of the femur after manipulation for congenital dislocation in a child with gonorrheal vaginitis. Dr. Ober described his operation for club-foot, the principle of which is an open dissection of the del-

told and calcaneo-scaphoid ligaments from the internal malleolus. The results showed over-correction. Dr. Soutter demonstrated his operation of subperiosteal separation of the muscles from the anterior superior spine in contraction at the hip due to infantile paralysis. Drs. Lovett and Martin described their method of determining the strength of various muscle groups by means of a spring balance, which was read at the moment of the breaking down of the voluntary resistance to the pull of the balance. This method is of value in determining the improvement in infantile paralysis by massage, etc. Dr. Legg showed two cases of transplantation of the pectoralis major into the acromion and spine of the scapula. Dr. Ehrenfried showed lantern slides of cases of multiple enchondroma. Dr. FitzSimmons demonstrated a new machine for reduction of congenital dislocation of the hip. Dr. Sever showed Volkmann's paralysis and obstetrical paralysis, disagreeing with the views of T. T. Thomas as to the etiology of the latter condition, and submitting his experimental research to refute Thomas' theories. Dr. Soutter showed the results of reduction of congenital dislocation of the hip, and laid emphasis on the after-treatment, splitting the plaster at the end of two months for motion, but not allowing the child to walk for six months. Dr. Legg discussed the etiology of Perthes' disease, basing his theories on a very large series of cases, and suggested that traumatism to the epiphysis was the chief etiological factor. Drs. Post and Brown showed many lantern slides of bone syphilis, many of them being unusual forms and a truly wonderful collection.

Friday afternoon was spent at the Robert Brigham Hospital, which deals with chronic cases, not necessarily confined to orthopedics, but involving many orthopedic problems, especially border-line cases. The various members of the staff demonstrated their work, especially the problems on which definite study was being done. Dr. Brown showed the various methods used to correct faulty posture. Dr. Painter discussed the classification of arthritis, making two large groups, metabolic and infectious.

## Book Reviews

*Bone-Graft Surgery.* By FRED H. ALBEE, A.B., M.D., F.A.C.S. With 332 illustrations, three of them in colors. Philadelphia and London: W. B. Saunders Company. 1915.

Albee's book on Bone-Grafts presents strong evidence of the wide applicability of this very special branch of surgery. Although we may not entirely agree with the enthusiastic views of the author as to its scope nor share his complete optimism as to the uniformity of successful results, the method of autogenous bone graft has been demonstrated to be a most valuable one, and Albee perhaps more than any other man is responsible for its popularization.

The author maintains that the accurate shaping and fitting of the bone grafts which his electric motor outfit makes possible has sounded the knell of the metallic bone plates. He believes metal plates favor non-union.

Perhaps the most interesting chapter is that dealing with the control and cure of tubercular caries of the spine by means of autogenous grafts inserted into the split spinous processes of the vertebrae. We are glad to recognize a somewhat more conservative attitude toward the duration of

after treatment than in the original statements of the author. There is generous notice taken of the work of other men, with one notable exception which somewhat mars the judicial character of the volume.

The work should be widely read, and marks a distinct contribution by an orthopedic surgeon not only to his own specialty but to general surgery as well.

*Diseases of Bones and Joints.* By LEONARD W. ELY, M.D., New York: Surgery Publishing Co. 1914.

This is a small book of 220 pages, which deals in a concise way with the pathology and treatment of bone and joint diseases. As stated in the author's preface, it is founded on a pathological basis, since "a comprehension of the pathology of disease is a prerequisite for treatment." Although primarily intended for the general practitioner, it is well worth reading by those who are teaching, on account of its logical method of approach to a complicated subject.

At the present time our knowledge of the pathology of bones and joints is certainly embryonic and any attempt to clarify the subject is certainly worthy of consideration. It is not yet possible to establish one standard of classification for chronic arthritis, but the author's attempt is logical and concise, and makes a good teaching standard.

The book is that of a clinician and teacher who has had a fair laboratory experience, which is a good combination. It is along such lines that we hope our future text-books on Orthopedic Surgery will be based.

The table of contents gives a good conception of the scope of the book. 1. The Anatomy, Physiology and Pathology of Bones and Joints. Preliminary Consideration. 2. Acute Arthritis. 3. Chronic Arthritis, Type 1, Tuberculosis, Syphilis, Gonorrhea. 4. Other Cases Under Type 1. 5. Chronic Arthritis, Type 2. 6. Ankylosis. 7. Diseases of the Shafts. Acute Osteomyelitis. 8. Chronic Inflammations in the Bone Shafts. 9. New Growths in Bone.

*Orthopedic Surgery.* By EDWARD H. BRADFORD, M.D., AND ROBERT W. LOVETT, M.D. Fifth Edition. New York. William Wood & Company. 1915.

Bradford and Lovett's Orthopedic Surgery has run into its fifth edition. This fact is an indication of the demand for the book and the esteem in which it is held. Although it is a text book, it is also a valuable reference book for practitioners. There is no padding; indeed one could wish for a more comprehensive discussion of some of the subjects touched upon, especially those which belong to the orthopedic surgery of adults.

There is a receptiveness shown toward recent "advances" in treatment which is strongly tinged with a healthy conservatism. There is a demand that definite results should be demonstrated before the older successful, if more tedious, methods are abandoned.

The illustrations portraying pathology of the lesions, the symptoms, and the treatment are many and well chosen.

# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.

Departments I, II, and III were reviewed in the issue of January, 1916.

## III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

DIAGNOSIS AND TREATMENT OF SIX TYPES OF CHRONIC JOINT DISEASE. By T. Brugsch. *Therapie der Gegenwart*, July, 1915, LVI, No. 7.

The writer classifies chronic joint disease, exclusive of tuberculosis, syphilis and chronic suppurative processes of joints, as follows: (1) chronic rheumatism, (2) chronic infectious arthritis—groups one and two are considered together as arthritis adhaesiva.—(3) chronic destructive polyarthritis, (4) osteoarthritis deformans, (5) chronic destructive polyarthritis uratica—chronic irregular gout—(6) neuropathic arthritis *e. g.*, tabes and hemophilia.

In the diagnosis of arthritis adhaesiva, he regards as essential (1) slight elevation of temperature over long periods, (2) presence of chronic disease of tonsils or other mucous membranes, (3) some sign, even though trivial, of endocarditis.

The chronic destructive polyarthritis, so-called rheumatoid arthritis, is distinguished from the preceding, in which a rheumatic basis is implied by the absence of the diagnostic points just mentioned, and the presence of other infectious factors. In this group he would include chronic gonorrheal tuberculous rheumatism and the arthritides due to typhoid and other pyogenic organisms, as well as those associated with intestinal intoxication and chronic colitis. The clinical significance of this group is much less than that of the preceding group.

Chronic destructive progressive polyarthritis. Here there is absence of all infectious factors, the condition being considered the result of a joint diathesis. Onset as early as second decade, with involvement especially of small joints. Presence of marked muscular atrophy and periods of painful exacerbations. He believes that some of these cases depend upon a disturbed calcium metabolism.

Osteoarthritis deformans, which is regarded primarily as a surgical affection, receives scant attention.

Chronic destructive irregular forms of gout. These forms may develop either as a chronic affection from the very beginning or else on the basis of repeated acute attacks. The diagnosis is based largely on the blood and urine findings, the characteristic x-rays, as well as on the presence of tophi.

In the neuropathic type the x-rays show marked destruction of the joints with secondary proliferation.

In the treatment of the infectious type, removal of the primary focus is essential, followed by careful treatment of the joints locally. This includes

in the adhesive type, active hyperaemia, active and passive exercises, injection of thiosinamin for resorption of adhesions, mud baths, medico-mechanical measures, including hot air, diathermy, etc.

Aside from the dietetic treatment in the irregular forms of gout, the author claims good results from administration of aguttan, which he regards more valuable than atophan. In the gonorrheal type, passive hyperaemia has given good results. The author's classification does not appear to add materially to our present understanding of the situation.—*F. J. Gaenslen, Milwaukee.*

**CASE OF OSTEOMYELITIS WITH PYEMIA.** D. Murray Lyon. *Edinburgh Medical Journal*, July, 1915, pp. 18-28.

Report of one case is an eleven year old school girl, with complete clinical history, notes from the post-mortem examination, and microscopical findings of the internal organs and bones. The author discusses at some length the differences between septicaemia, pyaemia, bacteriaemia and toxemia.

His summary of the case is as follows: "The condition began as a septicaemia with staphylococci in the circulating blood. This was followed by an acute osteomyelitis in several of the bones, and after a rather long interval (18 days), general pyaemia occurred with the formation of abscesses in the internal organs. Throughout the disease there was a varying degree of toxemia which could be followed graphically on the temperature chart." "The case illustrates the tendency in young persons for staphylococci to settle in the bones (osteomyelitis) and the apparent immunity of the other healthy tissues to attacks of the micro-organism." It is an interesting, very complete report illustrated with five photographs.—*Herman W. Marshall, Boston, Mass.*

**ILEOCOLECTOMY AND COLECTOMY FOR ARTHRITIS DEFORMANS.** Rea Smith, *Journal A. M. A.*, August 28, 1915.

The author believes, with Lane, that the lowered resistance accompanying intestinal stasis is largely responsible for the microbic invasions which cause chronic arthritis, and further, as a result of bacteriological examinations of the walls of the ileum and colon, has concluded that the chief portal of entry of the streptococcus into the blood stream is at this point. The removal of teeth, tonsils and other possible foci of infection did not relieve the arthritis in the fourteen cases reported, while following ileocolostomy the pain and stiffness of the joints disappeared in less than 48 hours. In half of these cases, joint symptoms recurred, but removal of the colon down to the point of anastomosis was followed by permanent relief. There was one death in the fourteen cases, due to poor operative risk. The author uses Lane's technic and believes that none of the difficulties of faulty mechanics attributed to this operation will be met if the colon is left unobstructed.—*Eben W. Fiske, Boston.*

**SYPHILITIC ARTHRITIS.** H. S. Stein, *Med. Record*, 1915, LXXXVIII, pp. 472-3.

The author makes the startling statement that syphilis is responsible for 20% of chronic joint diseases. The clinic from which his statistics are drawn is the Hospital for Deformities and Joint Diseases, New York. The body of the paper does not permit readily of abstracting. His conclusions are:

1. Syphilis of joints is of frequent occurrence and comprises about 20% of cases seen at the Hospital for Deformities and Joint Diseases.

2. It produces almost every form of arthritis and may be either primary in the joint or secondary to involvement of the adjacent bone.

3. It must be differentiated from acute articular rheumatism, gonorrheal rheumatism, rheumatic arthritis, arthritis deformans, tuberculous joints, malignancy and traumatic synovitis.

4. In infants, epiphysitis with secondary joint involvement is the most common type. In children from 8 to 15 years of age, hydrops or simple synovitis is the usual manifestation. The arthritis deformans type forms the bulk of cases occurring in acquired syphilis.

5. Pain as a rule is not severe and is worse at night.

6. Limitation of motion is not so marked as the appearances would indicate.

7. The diagnosis depends on history, concomitant signs and symptoms of syphilis, Wassermann and luetin tests, x-ray and therapeutic test.

8. The possibility of syphilis should be considered in every case of joint disease of vague origin.—*M. S. Henderson, Rochester, Minn.*

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STILL'S OR MIKULICZ'S DISEASE? H. Strauss. *Med. Klinisk*, XI, No. 21, May 23, 1915.

Strauss reports a case of a man 59 years old who exhibited the Still triad (chronic arthritis, enlarged spleen and general glandular hypertrophy) and also chronic indurative inflammation of both parotid and submaxillary glands, thus lacking only involvement of the lacrymal glands of Mikulicz's symptom-complex. He sees in this and other cases which he cites, sufficient reason for regarding the two, especially from the standpoint of etiology, as related conditions.

The patient had syphilis 24 years previously. The joint affection came on eight months previously. He had had pain, swelling and limitation of movement in various joints, but at present shows only the *main-en-griffe* deformity of both hands. The skin on the back of the hands is very thin, glistening and only slightly movable. The x-ray shows no involvement of the bony joint structure. The glands of the whole body are swollen, hard, but movable. Chains of glands are palpable in the neck, axillae, chest walls, along the inner surface of the arms to the elbows, in the groins and down the legs to the knees. The spleen is palpable almost two finger-breadths below the costal margin. The liver is two finger-breadths below the costal margin. Lungs, heart and nervous system are not remarkable. The mucous membranes of the nose and throat are red, dry, crusted over; the tonsils dry and fissured, the turbinates enlarged and deflected. Wassermann, blood, urine all negative. The patient received a course of neosalvarsan without appreciable effects.

The case is unusual because of the patient's age—59—the next oldest, to Strauss' knowledge, being two young women of 24 and 26 years respectively, reported by Pollitzer. These two also showed chronic naso-pharyngeal infection and, over the affected joints, atrophic skin.

There was no evidence of disturbance of internal secretion (thyroid) nor of tuberculosis, though a tuberculin reaction test was precluded by a subfebrile temperature. Against syphilis were the negative outcome of the Wassermann test and neosalvarsan treatment.

Despite the fact that the lacrymal glands were not involved with the submaxillaries and parotids, there is ground for considering this a case of Mikulicz's disease, for H. Frenkel has reported a case of the latter without the participation of the lacrymal glands, and Plate and Lewandowsky, a case with simultaneous spleen enlargement, general lymphadenitis, subfebrile tempera-



ture and an erythema nodosa-like skin infection. These authors, in agreement with Mikulicz himself, do not consider this a simple case of the latter's syndrome, but ascribe it to a general infection referable to the mucous membranes. The frequency of moderate fever in the chronic joint disease of growing individuals—suggesting endocarditis, typhoid and early phthisis—the frequency of gland involvement, (50% of Ellermann's series), the greater frequency of moderate fever in nearly all chronic polyarthritides according to Fr. v. Müller, all point to infection as a cause.

In Still's disease we have the picture of a chronic infection acting selectively on the lymph glands at the time of life when they are most susceptible. The joint involvement has more the character of a coördinate or secondary affection.—*Freeman Bosworth, Boston.*

**SURGICAL TREATMENT OF ACUTE OSTEOMYELITIS.** W. L. Wallace, *New York State Journal of Medicine*, February, 1915.

Acute osteomyelitis is a pyemic infection of bone, starting in the spongy portion on the shaft side of the epiphyseal cartilage, the germ usually the staphylococcus, rapid and extensive neurosis, and demands immediate surgical treatment.

It may follow scarlet fever or streptococcic infection, appearing within a few days; after pneumonia or grippe in about two weeks; typhoid fever in four weeks. It usually occurs in young subjects. The femur and tibia are most frequently attacked. Simple fractures or simple traumatic arthritis rarely become infected.

The symptoms of acute septic osteomyelitis are intense. Chill, fever, prostration, headache, delirium, coma, pain and tenderness.

The diagnosis must be made before an x-ray would show damage.

Surgical treatment: At once opening the bone with a drill or chisel within 12 to 24 hours of the initial chill.

Prevention lies chiefly in avoiding the breathing of germ-laden air, as closely packed, poorly ventilated schools and homes.

Discussion: Dr. Robert H. M. Dearborn, New York. Exposure by trephine or chisel the full width of the medullary canal at both its ends in the diseased bone, pass through the canal a wire or probe and draw through a strong fishline to which have been fastened at equidistant points small pledgets of gauze saturated with tincture of iodine. These are then drawn back and forth through the shaft, removing all the marrow, and then withdrawn. The marrow cavity is then filled with Beck's bismuth paste and this is reinjected at intervals of a few days until healing occurs.—*Walter G. Elmer, Philadelphia.*

**NOTES ON RHEUMATISM IN CHILDREN.** By Mary H. Williams. *Lancet*, June, 19, 1915.

Dr. Williams records her experience of the last 11 years as senior medical inspector of the city schools of the city of Worcester, England. She points out a peculiar cachexia in little children of five to ten years of age that leads, she thinks, inevitably to rheumatic conditions later. The child is twitchy and nervous by day, has peculiar growing pains, has quick pulse rate and continued pyrexia, etc. The author notes the well recognized relationship between valvular heart troubles, tonsillitis, appendicitis and other infective conditions with rheumatism. She makes no attempt to define the disorders she classes under the term "rheumatism." It is interesting to note Dr. Wil-

liams' conclusions in relation to the subject of tonsil operations:—"I would like to take this opportunity of protesting against enucleation of the tonsils. It is often said that guillotining is no good, for the condition recurs. For several years I have kept detailed notes for all the operative cases I have seen, most of them done by general practitioners, and I find that in the majority of cases, *if the operation is not done at too early an age the result is a cure*; and I think that whether it is or not, one has no right to remove organs until one is sure that their influence for good is less potent than their influence for evil. It is possible that the rheumatic germ grows in the tonsil, but, on the other hand, it has been argued that the tonsils have a protective function. They may thus act as a barrier against rheumatism, and may only fail in this duty under repeated and severe attacks of the germ. If so, I think some portion should be left for defensive purposes."—*Edward A. Rich, Tacoma.*

**GLUTEAL MYOSITIS—A CONDITION NOT HERETOFORE DESCRIBED.** By Norman Sharpe and Percy Willard Roberts, *Med. Record*, CXXXVII, 1915, pp. 1064-8.

The authors describe as a definite clinical group 16 cases and call it gluteal myositis. It was found in persons with a generally soft and weak musculature. They think a constant strain on weak gluteal muscles as a group causes the symptoms. The myositis is sharply localized, being usually limited to the gluteus medius and tensor fasciae femoris, and sometimes involving the gluteus minimus and maximus to a slight extent. The condition is strictly localized, no other muscles in the body being involved. Objective findings other than tenderness were negative except occasionally a little temporary spasm. Treatment has been satisfactory, deep kneading massage being emphasized. If the tenderness is too extreme, this is preceded by a plaster of Paris spica cast for a week or two until this tenderness has subsided, when the heavy massage is given.—*M. S. Henderson, Rochester, Minn.*

**VACCINE TREATMENT OF GONORRHEA AND GONORRHEAL COMPLICATIONS.** By O. Boeters. *Deutsche medizin. Wochens.*, 1914, No. 39. Abstracted in *Zent. f. chir. u. mech. Orth.*, June, 1915, p. 129.

The author is pleased with the Arthigon treatment of gonorrheal arthritis. An inflammation of the shoulder girdle was completely cured after four intramuscular injections inside of twenty-five days; the same result occurred after two injections given intravenously in disease of the elbow joint. In two other cases the joint was punctured, and seven to twelve injections were necessary to effect a cure. In another very chronic case great improvement, but not cure, was produced, a teno-synovitis remaining uninfluenced.—*Roland Hammond, Providence.*

**RHEUMATIC FEVER AND RHEUMATOID ARTHRITIS; THE GEOGRAPHICAL FACTOR.** By J. T. Clarke, London. *The Lancet*, June 5, 1915.

Certain geographical locations of the world, especially the tropics, do not produce rheumatic fever and rheumatoid arthritis. This is due to the contention that the heat of the tropics is inimical to some organisms. Clarke claims that rheumatoid arthritis is a specific disease due to "specific organism and usually gains a foothold in individuals that have previously suffered from acute rheumatic fever." The author uses considerable statistics and many authorities to prove his contentions. He concludes that the geographical locations where these disorders are not produced are apt to be places suitable for the treatment of cases developed elsewhere. Egypt he cites as a favorable location.—*Edward A. Rich, Tacoma.*

#### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

CONTRIBUTION TO THE DIAGNOSIS OF GOUT. By J. B. Berkart. *British Med. Journal*, July 31, 1915.

Berkart calls attention to a pathological process, of frequent occurrence, which gives rise to clinical phenomena closely similar to those commonly called gouty paroxysms, but which are not due to uric acid. What occurs is a cystoid degeneration which starts in the epiphysis of the metatarsals and occasionally in the phalanges, extending into the articular cartilage, and, after perforating it, allows the discharge of the cystic contents into the joint, thus producing an acute "perforative synovitis."

The author infers from the histological findings that the cystoid degeneration originates from an anomaly of the vascular and osseous systems. A frequent complication of this condition is a lymphangitis and the whole leg may become the seat of a leucophlegmatic edema.

Cystoid degeneration is readily distinguished from gout by the absence of swelling of the regional lymphatic glands.—*Robert B. Cofield, Cincinnati.*

GOUT. By Max Strunsky. *Med. Record*, 1915, LXXXVIII, p. 484.

Strunsky calls our attention to the fact that whereas years ago much was said and written about gout, now we seldom see or hear of a case. He suggests that probably syphilis and gonorrhea are responsible for the "rich" and "poor" man's gout rather than the quality of the foods and liquids. The chronic and acute infectious arthritides were probably formerly all claimed as gout.—*M. S. Henderson, Rochester, Minn.*

INFANTILE SCURVY, II; A NEW ASPECT OF THE SYMPTOMATOLOGY, PATHOLOGY AND DIET. By Alfred F. Hess. *Journal A. M. A.*, September 18, 1915, p. 1003.

Pasteurization of milk tends to scurvy. Careful examination in the author's cases showed enlargement of the right heart. The fact of the similarity of scurvy and beriberi led to the use of a food containing the outer layer of the wheat, which, while it relieved the symptoms, did not cure the scurvy.—*Edward S. Hatch, New Orleans.*

ACHONDROPLASIA. By Maas. *Berliner klin. Wochenschr.*, 1914, No. 39. Abstracted in *Zentralbl. f. chir. u. mech. Orth.*, June, 1915.

A case was reported of a patient twenty-eight years old. He was 119 cm. high. The upper arm measured 18 cm., the forearm, 14 cm. The fingers were short and all of almost the same length, while the nails were very short and broad. The epiphyses of the elbow and the hands were thickened. The trunk was proportionately heavy, and the back, lordotic. The thigh measured 24 cm. and leg 27 cm. The head was large and broad.—*A. Bruce Gill, Philadelphia.*

OSTEOCHONDRITIS DEFORMANS JUVENILIS. By Nieber. *Deutsche medizin. Wochenschr.*, 1914, No. 32. Abstracted in *Zent. f. chir. u. mech. Orth.*, June, 1915, p. 140.

The patient, an 11 year old girl, had a severe attack of pain in the left upper thigh and soon afterward began to limp. Evidences of coxitis were not found. The Röntgen examination showed the characteristic appearance of osteochondritis—localized radiability of the upper epiphysis of the femur and flattening of the head of the bone. Thirteen cases in the literature had

a favorable outcome, but lasted for several years. In treatment, movements of the joints are of advantage. The disease is to be sharply differentiated from arthritis deformans in the adult.—*Roland Hammond, M.D., Providence.*

**HEREDITARY INFLUENCES IN ACHONDROPLASIA WITH REPORT OF A CASE OF CAESAREAN SECTION.** By J. Edward Pirrung. *Lancet-Clinic*, May 1, 1915, p. 496.

Pirrung briefly describes the characteristic structural changes found in this interesting deformity and gives the case history of an achondroplastic dwarf delivered at term by Caesarean section. The child died on the twelfth day, and x-ray plates and photographs were presented to show the existence of the disease in the child as well as in the mother.—*R. B. Maddox, Cincinnati.*

**RHACHITIS.** By W. L. Rost. *New York Med. Journal*, September 4, 1915. Nothing of orthopedic interest.—*C. A. Parker, Chicago.*

## V. SCOLIOSIS AND STATIC DISTURBANCES.

**RESEARCH IN MECHANICAL PATHOLOGY OF FOOT WITH THEORETICAL SUGGESTIONS OF MORE RATIONAL TREATMENT.** By B. Belove. *Southwest Journal of Medicine and Surgery*, August, 1915.

The author makes certain measurements on x-ray plate in certain foot cases and finds that individual bones have their positions altered in weight bearing.

He lays special emphasis on the cuboid, which may be displaced upward or downward or twisted, and often to different degrees in the two feet. In flattening of the arch the individual bones have the upper edges of their joints impinged while lower margins gap. He states that if the foot is raised too far or over corrected, the opposite occurs. Consequently, bones should be "approximated at 180°."

Conclusions are based on only a few cases and are chiefly that, "Certain conditions of bones of the feet, overlooked by other methods of diagnosis, may be ascertained by measurement"; and that, "Over correction as well as under correction should be avoided."—*C. L. Lowman, Los Angeles.*

**WEAK FOOT, WITH ESPECIAL REFERENCE TO TREATMENT.** W. B. Owen. *Lancet-Clinic*, April 3, 1915, p. 388.

After justly censuring the indiscriminate and faulty use of "arch supports and anti-rheumatic" drugs in weak feet, Owen briefly describes the anatomy of the foot and pathology of this condition. In his opinion, the chief etiological factor is improper shoes, and he supports this view by stating that the ratio of increase in frequency of the deformity in question is greater in females than in males.

The restoration of normal balance by the correction of faulty attitudes, the functional development of the leg muscles by massage and active exercise and the use of proper shoes are the suggested lines of the treatment, and the author, in closing, draws the following conclusions:

1. Weak foot occurs more frequently in females than in males, and in the majority of instances is caused by the wearing of improper shoes.
2. The most reliable diagnostic symptom is pain when standing or walking, which is relieved by rest.
3. As a prophylactic measure, normal individuals should be taught to walk with the feet parallel.

4. Abducted feet should be forced to acquire a normal attitude by a fulcrum at the calcaneo-astragaloid joint.

5. All weak feet are amenable to treatment by mechanical or operative measures and proper exercise with the application of appropriate shoes.

6. All mechanical support should be withdrawn as soon as muscular power has been sufficiently developed.—*R. B. Maddox, Cincinnati.*

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MECHANICS OF THE HEELS OF SHOES AND PROPER CARE OF THE FEET. By A. Ritschl. *Deutsche medizin. Wochens.*, July 8 and 15, 1915, Nos. 28 and 29.

Ritschl gives diagrams to show that over-high heels affect injuriously not only the foot itself, but throw the whole weight-bearing mechanism more or less out of gear. By extending a moderately high heel backward, the tendency to pes sursum flexus, as with paralysis of the muscles of the calf, is automatically corrected. In conclusion he appeals to physicians as the leaders in enlightening the public in matters of health, to teach the necessity for properly constructed shoes and for regular gymnastic exercises of the feet as the most important element of the motor apparatus. The strength and the well being of the entire body depend in a large measure on the condition of the feet, and their development in children should be watched over with special care to avert injurious influences.—*Roland Hammond, Providence.*

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INITIAL STRAIN IN WEAK FOOT. P. W. Roberts. *New York Med. Jour.*, August 28, 1915.

Roberts emphasizes the rôle of the curved bearing surface of the os calcis as an important factor in the production of weak feet. As long as the thrust of the body weight strikes the surface upon which we stand in the middle of this arc, stability is maintained, and when it strikes to the outer side of the center it is especially insured; but let it strike to the inner side and the inner half of the foot is rolled down and the weaker ligaments stretched and deformity and disability produced. He suggests a heel plate so moulded as to clasp the os calcis on both sides extending forward only as far as its anterior extremity and raised on its inner side enough to restore the proper balance to this bone, with consequent relief of the pronation and disability.—*C. A. Parker, Chicago.*

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REFERRED PAIN IN FLATFOOT. By Max Strunsky. *Journal A. M. A.*, July 3, 1915, p. 26.

Two cases are cited of pain in the back in which, while the examination of feet was negative, arch supports gave immediate relief to the symptoms.—*Edward S. Hatch, New Orleans.*

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ARCH SUPPORTERS FOR FALLEN ARCHES. By Max Strunsky. *Medical Record*, July 24, 1915.

In this article Dr. Strunsky very pointedly shows that the laity are only abusing themselves by wearing ready-made supporters prescribed from their own diagnosis, that often irreparable loss is sustained and valuable time wasted by their neglect in consulting a physician. He mentions septic foci, gonorrhea and syphilis as too often present in cases of lameness, and raps the members of the orthopedic guild on their frequent oversight of the true cause of sore feet. The paper is very true and very much to the point.—*H. A. Pingree, Portland, Maine.*

RECUMBENT POSITION IN SCOLIOSIS. M. Strunsky. *New York Med. Journal*, August 21, 1915.

Strunsky makes a plea for the recumbent treatment of the incipient stages of scoliosis,—“the preplaster cast” stage as he calls it,—on the theory of a general spinal insufficiency being the basis of most cases of the deformity. He believes that the spine in this stage is an inadequate support to the structures depending upon it and that gravity is an important factor in producing the result.

His idea of treatment is embodied in the following statement:

“For every child who has a tendency to a weak spine, complete freedom from weight bearing function should be instituted, and all means to strengthen the musculature and promote the ossifying process of bone by gymnastics, or good food, fresh air, hydrotherapy, etc., should be tried until the spinal column gives positive assurance that it can cope adequately with the superincumbent weight.”

For the developed curve he advocates the usual corrective measures, but he believes in preventing as many as possible from reaching this stage. As it is no longer so rare to find definite scoliotic deformities at birth, it becomes an interesting question just how many cases may be observed and treated in the incipient stage.—C. A. Parker, *Chicago*.

TREATMENT OF SCOLIOSIS. By James K. Young. *American Journal of Medical Sciences*, July, 1915.

The author states that so much attention has been given of late to the treatment of the rotary form of scoliosis that the consideration of the functional type has been largely neglected. Since many of the rotary cases have at some period been of the functional type, and have taken on the rotary form through neglect or inefficient treatment, the consideration of the functional form becomes a matter of paramount importance.

The article is devoted to the consideration of the diagnosis and treatment of the functional type of scoliosis as practiced by the author. The organic type is not discussed.—Arthur J. Davidson, *Philadelphia*.

## VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.

EPIPHYSEAL OSTEOCHONDROMA OF THE UPPER RIM OF THE ACETABULUM OF THE HIP JOINT: EXTIRPATION OF THE GROWTH WITHOUT INJURY TO THE JOINT: RECOVERY. By R. Matas. *New Orleans Medical and Surgical Journal*, October, 1915.

This is a very interesting and rare case. Patient was well up to seven months before seeing Dr. Matas, when she began to have stiffness and pain in her right hip. Pain increased by walking. Two months ago felt some better and was up walking when she slipped and strained the hip. Has been treated for coxitis.

Physical examination shows tenderness over the area about the right hip joint and fullness about the joint.

The reviewer saw the patient and from the physical examination and x-ray photographs made a diagnosis of chondroma or sarcoma. At operation the tumor was found to be attached to the upper rim of the acetabulum and rested on the capsular ligament of the joint. It was removed and weighed forty grams and proved to be a pure fibro chondroma. A plaster spica was applied and the convalescence was uneventful.—Edward S. Hatch, *New Orleans*.

**BONE GRAFT IN A CASE OF SARCOMA OF THE RADIUS.** By J. H. Robertson.  
*British Journal of Surgery*, April, 1915, p. 669.

The author reports a case of periosteal sarcoma of the distal end of the radius, in a man of 59, treated by excision of the tumor area of the radius and adjacent carpal articular surfaces. To compensate for the bony loss, a graft was prepared from the amputated arm of another patient. The graft included a section of the distal end of the radius with its periosteum and the carpal ligaments. These latter were carefully stitched, especially posteriorly, and the radius wired to secure fixation. A fair degree of life maintained in the transplant, although it never attained the normal, until eleven months later a recurrence of the sarcoma necessitated amputation of the arm.

Robertson concludes that an iso-graft of this size, two and a half inches in length and including the whole thickness of bones, should survive, is remarkable, especially in view of what would be considered very unsatisfactory circumstances,—the environment of sarcomatous tissue, the absence of apposition with healthy bone ends and the very slight function attained. On the other hand, it must be considered that such a highly vascular structure as a sarcoma may form by no means so bad an environment as its abnormality might suggest.—*E. A. Rich, Tacoma.*

## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

**TREATMENT OF CONGENITAL DISLOCATION OF THE HIP BY MEANS OF THE LE DAMANY APPARATUS.** By Broca. *Revue de Chirurgie*, XXXIV, No. 7.

For the past three years M. Broca has used the LeDamany apparatus in the treatment of congenital hips and his end results have been so uniformly satisfactory that today he treats all his hip dislocations in this manner, as routine. The apparatus, however, is called into play only during the second period of his treatment, i. e., when M. Broca aims to bring the limb in line by tiring the muscles "progressively," as he puts it.

M. Broca's table of figures is as follows:

Forty-three bilateral dislocations with 40 permanent reductions.

One bilateral transposition and two failures due to the fracture of the neck of the femur.

Thirty-nine unilateral cases with 38 cures, and one failure from a similar cause—fracture of the neck.—*W. J. LaMarche, Cambridge, Mass.*

**ANTEVERSION OF THE FEMORAL NECK IN THE NORMAL FEMUR AND ITS RELATION TO CONGENITAL DISLOCATION OF THE HIP.** Herbert A. Durham, *Journal A. M. A.*, July 17, 1915.

In an examination of 200 normal femora to determine the frequency and extent of anteversion of the neck, it was found that the amount of anteversion varied from 0 to 35 degrees, the greatest number being between 2 and 20 degrees, with a general average of 11.9. Anteversion was, indeed, absent in only nine per cent. of the supposedly normal femora. As a result of these findings, the author believes that anteversion up to 35 degrees probably will not interfere with the maintenance of reduction in a congenitally dislocated hip, but that more than this, especially in cases with anteversion of from 45 to 90 degrees, is largely, if not wholly, responsible for the large number of anterior transpositions obtained after attempted reduction. Osteotomy of the femoral shaft should probably be done in those cases in which reduction could not be maintained after a fair trial, and in which the anteversion is greater than 30 degrees, especially if associated with a deficient acetabulum or short femoral neck, even though the femoral head is well formed.—*Eben W. Fiske, Boston.*

(To be continued in the March issue.)

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## A REVIEW OF THE TEN YEARS' WORK AT SEA BREEZE HOSPITAL FOR SURGICAL TUBERCULOSIS.

BY B. H. WHITBECK, M.D., NEW YORK.

THE foundation of the Sea Breeze Hospital at Coney Island, in June, 1904, gave to this country the first permanent institution for the treatment of surgical tuberculosis at the seashore. Similar institutions had been established in France and England, and the reports of the success of the treatment of patients in those countries were most encouraging. The treatment of surgical tuberculosis in the large clinics and hospitals of the cities has at all times afforded a more or less discouraging problem, despite the most careful treatment of the local lesions. It is recognized that in the majority of cases something more is needed to restore these patients to health. Tuberculosis of the bones and joints is essentially chronic and is prone to attack those in whom the general physical condition has been depleted by lack of proper nutrition, cleanliness and fresh air, and in whom a family history of tuberculosis may have been presented. These conditions all exist among the poorly fed, closely housed and uncleanly children of the tenements. It is no small wonder that these children, already made a prey to tuberculosis by their very existence, should fail to respond to the care and treatment afforded them in their intermittent visits to the clinic. They must still return to their lives of squalor and neglect, and their bodies starve for the want of proper support to combat the disease of which they are the victims.

It was to give to a limited number that state of physical resistance which is so essential to a successful issue in tuberculosis that the Sea

Breeze Hospital was established. It was an experiment at first, and the immediate benefits to be observed led the founders to continue the hospital on a more permanent basis. Ten years have now elapsed since the opening of the institution, and during this period the doors have never been closed winter or summer. It is of interest now to consider what this experiment has brought forth. What has been accomplished at the hospital, and has it fulfilled expectations?

In establishing the hospital, The Association for Improving the Condition of the Poor chose as the site for the experiment a space at Coney Island which was readily available, adjoining their Sea Breeze Home, an institution already several years in existence as a summer home for outings for women and children. Early in the summer of 1904, tents were erected on the sand, facing the ocean, and about thirty yards from the water. Sixty-two children were sent down to these tents. In selecting the cases from the city hospitals, children who seemed most to need the change were sent. Of the sixty-two cases, twenty-seven presented lesions involving cervical lymph nodes, seven involving the spine, twelve involving the hip, and sixteen involving various other joints. In a few of these cases there was more than one lesion in the same child. Thirty of these cases had one or more discharging sinuses.

In the fall, the improvement noted in the children was of such a character that the A. I. C. P. felt warranted in going on with the experiment. Thirty children were chosen to remain who held out the greatest hope of cure, and the others were sent back to the city. The latter cases have been under observation in the Fresh Air Relief Work from time to time, and their condition is known. The number of patients was rapidly raised to the full capacity of the hospital, namely forty-two, and this number has been maintained up to the present time.

The present hospital is situated at Coney Island, about ten miles from New York, and within fifty yards of the ocean. A sand beach stretches down to the water, making a splendid playground for the children. The building is a three-story frame structure with porches on the first and second floors. Two wards on the second floor accommodate the smaller boys and girls, and the older children occupy similar wards on the third floor. The wards are freely lighted by numerous windows and the porches are uncovered except for removable canvasses, so as not to obstruct the entrance of the sunlight into the wards. The windows are never closed, day or night, except when the children are dressing, so that a full circulation of air is constantly passing through the wards. Two isolation rooms are provided, in which new children are detained for two weeks after admission, and in case of an outbreak of an infec-

tious disease, quarters are used in a separate building. Plaster, dental and dressing rooms, and the operating room are on the second floor.

Two hundred and sixty-two cases have been treated at the hospital up to the present time. Five of these relapsed after discharge and were readmitted, and four others, taken out by their parents against the wishes of the attending surgeon, were subsequently readmitted, making a total number of admissions of two hundred and seventy-one cases. Of the two hundred and sixty-two cases, thirty-two of the original tent colony, already spoken of, were returned to the city when the permanent hospital was established. A summary of all the cases is as follows:

Dropped from the tents .....	32
Died .....	38
In hospital only a few days when removed by parents .....	9
Discharged as not tuberculous .....	7
Discharged with disease arrested ....	123
Discharged improved .....	10
Children still in hospital .....	43
<b>Total .....</b>	<b>262</b>

In considering the cause of death in the thirty-eight cases which have occurred, some important facts present themselves. In order to bring out these facts I shall take up all the cases treated in the hospital in three groups. The first group consists of the original tent cases, sixty-two in all; the second group, the next thirty-eight cases, thus completing in the two groups the first one hundred cases. The third group includes the remaining one hundred and sixty-two cases. In the first sixty-two cases there were twelve deaths, two from pulmonary tuberculosis, one cause unknown, and nine with amyloid degeneration. It will be remembered that thirty of this group had discharging sinuses on admission. The second group, of thirty-eight patients, dates from the time of establishing the permanent hospital. In order to test the full extent of the benefit of the sea air in the cure of the disease, many cases were admitted at this time in a very advanced and serious stage. Cases already suffering from amyloid degeneration were admitted, with very foul smelling sinuses, one with tuberculous peritonitis, some markedly emaciated, and one even in a moribund state. Thus in the thirty-eight cases of the second group, there were twelve deaths; two of pulmonary tuberculosis, one of sarcoma, (a child admitted with a mistaken diagnosis) and nine of amyloid degeneration. This completes the first one hundred cases in

which there were twenty-four deaths, eighteen of which were amyloid degeneration and four of pulmonary tuberculosis.

When we consider the third group, of 162 cases, the results are more encouraging. There have been only fourteen deaths in this group; two of general miliary tuberculosis, two of meningitis (in both of which cases the disease was in an early stage), three of pulmonary tuberculosis, three of amyloid degeneration, and a group of four cases which had been discharged cured of their tuberculous lesions and died, one of scarlet fever, one of measles, one of diphtheria, and one by accidental means. Only ten cases, therefore, in the one hundred and sixty-two died as the result of a tuberculous disease. During the period embraced by the third group, only two cases were admitted with amyloid degeneration. One has since died, and the other is alive, but not at the hospital. It is especially of note that only two cases had developed amyloid degeneration after admission to the hospital; one is dead, and the other is still living but has been discharged.

All of the cases, with very few exceptions, have been under observation frequently since their discharge, and those which had been discharged with the disease arrested are known to be in a state of health at the present time. Most of them have been seen or heard from within the past six months. The 10 cases discharged improved, have continued to improve, and are apparently well today. A summary of the cases discharged cured is as follows: Glands 17, spine 26, hip 22, knee 18, ankle 7, shoulder 2, elbow 4, jaw 1, finger 2, hand 2, in all 101 cases. The remaining 22 cases had involvement of more than one joint. Of the 10 cases discharged improved, 4 were glands, 2 hips, 1 knee, 1 ankle, the other two had more than one joint involved. Of the 133 cases discharged with the disease arrested or improved, 49 of those cured and 2 of those improved had presented discharging sinuses, every case was healed before discharge and has remained healed up to the present time.

The Sea Breeze Hospital was established to carry out a principle of treatment which is essentially conservative, and was intended to supplement the most skilful local measures towards the immobilization of the diseased joints by applying to the children the best possible surroundings, hygiene and food. It was therefore essential that the greatest care should be observed in the carrying out of these measures. The greatest attention has been given to the cleanliness of the children and their clothing. The life of the children has been so arranged that they should spend practically all of the twenty-four hours in the open air. During the summer months they have been out of doors all of the day except at meal time. During the winter months, the schooling has been

supplied by the Board of Education of New York City, and this has been carried on in rooms in which all the windows were wide open. The effect of this constant life in the open air has shown itself in each child very shortly after admission to the hospital. Whereas the children have come to the institution pale and tired, often very thin and with little or no appetite, very shortly the appetite has returned, the color has come to the cheeks, and a steady gain in weight was noted in nearly every instance. The children seem to have gained a vitality which they did not possess during their life in the city, and each child could be seen to grow stronger and more full of energy from day to day.

The treatment directed towards the local lesions has received the same careful attention in all cases as would have been carried out in the clinics and hospitals of the city. The institution has been fortunate throughout its whole existence in having had attending surgeons who have, with one exception, been trained along practically the same lines in the treatment of surgical tuberculosis. Therefore, there has never been a time, except at one period, when any radical departures have been made in the methods of fixation of the diseased joints and bones. Plaster jackets, plaster spicas, and plaster bandages applied to the smaller joints have been, as a rule, the means of fixation. In the more acute cases recumbency in bed, either on the Whitman frame or with traction, has been the rule. During one period the plaster treatment was very largely abandoned for the use of braces, and many cases were treated during that time in bed; both in the cases of spinal disease, and, with traction, in the cases of hip disease. Therefore it is not necessary to go into more detail in the consideration of the ordinary routine treatment well known to the orthopedic profession.

Certain special forms of treatment have been carried on in the hospital, however, which may well be considered briefly. The sinuses have been of particular interest, and various means have been employed in an effort to heal them. Bismuth paste was injected in several cases during a period of two years with a moderate degree of success. Several cases seemed to respond and the sinuses healed, apparently as a result of the injections. However, the treatment has not seemed to warrant its extensive use and it is now used only in selected cases. The two forms of treatment of the sinuses which have seemed to offer the greatest amount of success have been the sea bathing and heliotherapy. It has been noted since the beginning of the hospital that during the summer months the sea bathing has shown a marked benefit in the healing of the sinuses. The children have been allowed to go into the water with their dressings over the sinuses, and after the bath a fresh dressing is

applied. The discharge in some instances has readily diminished in quantity, the character of the discharge is changed from thick pus to a thinner consistency, and the odor has entirely disappeared in many cases where the discharge was previously offensive, and in a large number of cured cases in which the sinuses have healed, the sea bathing has played a very material part in the healing. In the very severe cases, which though improved during the summer have not healed, the more profuse and offensive discharge has returned when the bathing has stopped.

Certain cases of hip disease with sinuses have offered an opportunity for benefit from the ocean bathing, but because of the plaster spicas, it has been impossible to have the treatment carried out. With this point in view, I have used in one case a brace constructed on the principle of a spica, namely, with a side bar made from a tracing, with the thigh in extension and moderate abduction, extending from below the axilla to the knee, passing over the great trochanter and held in place by a thoracic band, a pelvic band and two thigh bands—one at the upper end of the thigh and one just above the knee. This case wore the brace at all times during the past summer except during the short interval of bathing when it was removed, because the hip was ankylosed, and promptly reapplied after the bathing. It is my intention, however, to supply other braces next summer, of the same character, but covered with rubber so that the patient can take the bath without removing the brace. This principle will be far superior because the patient will not be left at any time without support. The case above mentioned had a most offensive discharge from the sinuses, profuse and very thick, and although the sinuses did not entirely heal, the discharge was markedly diminished and the odor practically disappeared during the summer months.

Heliotherapy has done much in the treatment of the cases at Sea Breeze Hospital. The most pronounced benefit has been upon the sinuses, and in this form of treatment we have had a valuable means of caring for the sinuses for a longer period than the sea bathing could afford. It has been necessary to modify the treatment so successfully carried on by Rollier in his hospital in the mountains of Switzerland. The atmosphere of Switzerland, on account of the high altitude, is very clear and dry, and never very warm. In extremely cold weather, the children, without suffering from exposure, can go about unclothed in the sunlight the greater part of the time. In our more changeable climate, with the damp, raw days of winter and the hot, humid days of summer, great care must be exercised to protect the children from excessive chilling by the cold winds, and from the painful sunburn. Experience has

taught us that certain of the children do not do well when exposed to the winds during the fall, spring and winter; and it has also been noted that some of the children become very nervous and restless while being exposed to the sunlight on very humid days. However, throughout a greater part of the warmer six months of the year, the children have been subjected to this treatment. Several sinuses entirely healed during the past summer. During the summer, the bed patients are first exposed to the sunlight for a short interval, then, as the first burn turns to a deepening tan, the time of exposure is extended until patients lie continually exposed throughout the day. Children who are up and about are exposed to the sunlight during the day, usually for the entire morning. Pigmentation becomes very deep, and the beneficial effects seem to depend largely upon the relative amount of pigmentation. In patients wearing plaster casts with openings where the sinuses exist, the sunlight is allowed to play upon the exposed areas. The influence of the exposure and its beneficial effects upon the sinuses, especially in those who were exposed for the entire day, have been marked. The healing has been decidedly rapid, and in appearance the sinuses have become cleaner and the discharge diminished until the sinuses have closed.

The treatment of abscesses has been as follows: Psoas abscesses when deep seated have, in most instances, been treated by recumbency in the hope that absorption would take place and in some instances with success. When the abscesses have become larger, two methods have been employed: one aspiration and the injection of Calot fluid, which was distinctly beneficial in certain of the abscesses. This procedure was carried out as often as the case indicated until the pus no longer returned. The other method was the usual one of incision and gentle expressing of the pus and debris and sewing up the wound under the strictest aseptic conditions. This method has seemed the most satisfactory in the greater number of instances, and it is my custom to carry it out in all cases at the present time.

Several cases presented discharging ears at some stage of their illness and at times this condition was very persistent until the adenoids and tonsils were removed, when the majority of the ears ceased discharging. This experience has led us to examine each child in the hospital and remove the adenoids and tonsils when indicated.

In the use of plaster of Paris dressings, the greatest care has been exercised in the details. Plaster bandages have been made of the best materials. In the application of the bandages, sheet wadding has been carefully used and the bandages applied with every precaution against pressure sores. In the conservative treatment of the spine, the Calot



jacket has been used with decidedly beneficial results, and in my opinion it has played an important part in the cure of many patients. When the jackets were introduced, they seemed immediately to fill a much needed means of supporting and fixing the upper dorsal and cervical spines. The military jacket was used in all cases of dorsal disease between the sixth and tenth vertebrae, the grand jacket for all cases above the sixth vertebra. In the use of plaster in the treatment of the hips, the short spica was used except in the more acute cases in which the plaster was extended to the ankle or included the foot, and the child kept in bed until all signs of the acute condition had subsided.

In the years 1911 and 1912, certain cases of disease involving the spine were operated upon to produce fixation. In the first four cases a plastic operation was done and the adjacent spines were separated and broken—one half down to the adjoining spine below, and the other half upward to meet the broken half of the spine above. The periosteum of each spine was sutured together in tube fashion. The results of these four cases are as follows:

CASE 1. Susie B. Admitted August 7, 1907. Duration of disease before admission, six months. Location of the disease, the seventh dorsal vertebra. Operation April, 1911; discharged from Sea Breeze with disease arrested December 20, 1912. In January, 1913, the disease relapsed and a second similar operation was done at the New York Orthopedic Hospital in New York City.

CASE 2. Willie J. Admitted to the hospital in 1909. Existence of the disease four months before admission. Location of the disease, eighth dorsal vertebra. Child on a frame at the time of operation, with acute symptoms. Operation April 1, 1911. In May, 1914, the boy was still in hospital walking with a decided lateral lean, and wearing a spinal brace. Knee jerks decidedly increased, and pain on motion in the spine. The child was placed on a frame for four months with a decided improvement; pain lessened and a diminishing of the exaggerated knee jerks. A plaster jacket was then applied with the child held face downward, hyper-extending the spine, and these jackets have been worn up to the present time. The child walks strongly and with the body held erect and no active symptoms appear at present.

CASE 3. John T. Admitted June 21, 1910. Duration of the disease before admission, eighteen months. Location of the disease, the ninth and tenth dorsal vertebrae. Operation April 1, 1911; discharged October 8, 1912, with disease apparently arrested. One year later recurrence with abscess and a sinus formed. Now pulmonary tuberculosis has developed and the deformity of the spine has greatly increased.

CASE 4. Mabel W. Admitted June 24, 1909. Location of the disease, the ninth dorsal vertebra. Operation April 1, 1911; discharged August 16, 1914. The disease was apparently arrested but the deformity had increased since the operation.

In the next eleven cases operated upon, a bone graft from the tibia was inserted into the split spinous processes.

CASE 1. Robert A. Admitted August 20, 1907. Existence of the disease four months before admission. Location of the disease, eighth dorsal vertebra. Operation November 19, 1911. Wearing a Calot jacket with a military collar previous to this date. Discharged from the hospital in good condition with disease arrested. Child still in good condition.

CASE 2. Arthur G. Admitted to the hospital in May, 1910. Duration of the disease one month before admission. Location of the disease, tenth and eleventh dorsal vertebrae. Patient up and about and wearing an ordinary plaster jacket up to one month before operation, and running an uneventful course. Operation May 25, 1912. The wound did not heal by primary union, but presented a small discharging sinus up to May, 1914. At the time of the operation an abscess was opened in the operative field. However, the graft was inserted and the wound closed. The x-ray showed that the graft did not entirely include the diseased area, but was too short. In May, 1914, the boy, on examination, walked with a decidedly weak gait and with a forward and lateral leaning of the body; motions were painful in the spine and knee jerks exaggerated. Child's condition poor. A Calot jacket with military collar applied and the boy gained steadily in strength and eight pounds in weight. All active symptoms in the spine have disappeared and the boy is in excellent condition, but still wearing a plaster jacket.

CASE 3. Margaret O'N. Admitted to the hospital in 1908. Location of the disease, twelfth dorsal and first lumbar vertebrae. Duration of the disease, one year before admission. The child was in bed on a frame because of an active hip disease of recent date. At the time of the operation, August 2, 1912, no active symptoms presented themselves in the spine. Two months after the operation two pieces of graft came away from the wound which then healed. In May, 1914, the child presented an acutely flexed and adducted hip. The wound over the operative area in the spine was entirely healed, showing no signs of active disease. A large abscess presented in the left iliac fossa extending over Poupart's ligament. The abscess remains at the present time as above noted, but is somewhat diminished in size. The child is at present wearing a plaster spica, the greater part of the deformity being corrected under an anesthetic, and is in excellent condition.

CASE 4. Kenneth B. Admitted to the hospital July 24, 1910. Duration of the disease before admission, two years; location of the disease, twelfth dorsal and first lumbar. Child on a frame before the operation on July 19, 1912, because of the acute condition in the spine. The child was discharged from the hospital with the disease apparently arrested and in excellent condition on August 13, 1913, and condition remains good at present.

CASE 5. Mary J. Admission to the hospital February 22, 1905, with disease of the knee. Spinal symptoms developed June, 1906. Location of the disease, eighth dorsal vertebra. Patient treated by ordinary jackets and discharged July, 1909, with disease apparently arrested. Readmitted May 26, 1911, with disease relapsed. Operation June 24, 1912. Child discharged from the hospital again with disease apparently arrested. The condition has now relapsed, with the deformity steadily increasing. The child's mother at present refuses any further treatment by doctors.

CASE 6. James L. Admitted June 26, 1911, with an acute spinal condition. Location of disease, lower dorsal. The condition remained acute and the boy was on a frame at the time of operation, July 5, 1912. The result of the operation was that the disease was apparently arrested, but the boy died one year later in Bellevue Hospital of an acute abdominal condition.

CASE 7. Harry S. Admitted April, 1908. Treated by Calot jackets with military collar. Recommended for discharge with disease apparently arrested on July 9, 1910. The child did not leave the hospital, however, as the condition of the spine seemed to warrant further observation. No history of a recurrence of the disease appears, but the deformity seemed to increase. Operation on December 14, 1911. Discharged with disease arrested September 13, 1912. The boy at present is in excellent condition with only a slight deformity, and no evidence of any active disease is apparent.

CASE 8. Alfred H. Admitted April, 1909. Duration of the disease eighteen months before admission. Location of the disease, twelfth dorsal vertebra. Operation January 6, 1912. Discharged from the hospital August 20, 1913, with disease arrested. The child is at present in excellent condition with no evidence of any active disease.

CASE 9. John V. Admitted May 3, 1912. Duration of disease two months before admission. Operation just previous to admission to the hospital. Discharged October 13, 1912, with disease arrested. Child in excellent condition; gained three pounds while in the hospital.

CASE 10. Jeanette R. Admitted March 16, 1912. Operation previous to admission. Discharged September 25, 1913, with disease

apparently arrested. Taken out by parents against advice of attending surgeon. The deformity increased steadily, however, while in the hospital. Brace applied March 7, 1913, six months before discharge. Child left the hospital wearing the brace. One month after discharge brace removed, and the child improved; since then she has gained weight and at the present time is in excellent condition.

CASE 11. Kenneth S. Operation performed August, 1911, admitted afterwards, October 13, 1911. Child in good condition at the time of admission, then intestinal trouble developed which persisted throughout his stay at the hospital. The child began to run down in health, and was put on a frame. X-ray shows graft too short, only three vertebrae included. Wearing brace at the time of discharge, July 8, 1913. Unimproved, with three discharging sinuses; child thin and emaciated. Two other operations were performed at the New York Orthopedic Hospital, first, one year ago, and the second three months ago. The boy is now walking, weak in the legs, but much improved.

The average age of the cases operated upon was six years. Of the four cases in which the plastic operation was performed, three cases relapsed and showed active symptoms of disease at a subsequent period. The fourth case shows no return of symptoms but the deformity is increased. In the eleven cases in which the graft was transplanted from the tibia, seven cases present no active symptoms at the present time, and the disease is apparently arrested. One case, however, Case 3, developed a psoas abscess nearly two years after the operation. Three cases showed a decided relapse; Cases 2, 5 and 11. Case 5 had already been readmitted for a relapse, was also suffering from disease of the knee joint, and shows a lack of resistance throughout the course of her disease.

During the year 1913 and the first few months of 1914, braces or recumbency, with traction, replaced the use of plaster of Paris. The Taylor spinal brace, and usually, the hip splint and high shoe were used. Plaster of Paris was used for the knee, ankle, and other small joints. On May 1, 1914, twenty cases were in bed, of which seventeen cases were suffering from hip disease and wore traction with the limb on an inclined plane. The remaining cases were spinal disease, two of which were on Whitman frames, the others wore braces. The condition of these children was fairly satisfactory, and no active symptoms appeared except in one case with disease of the spine with pressure symptoms, and one case of pronounced amyloid degeneration; an involvement of the spine and both hips. It seemed wise, therefore, to get these children up, with exception of the acute cases mentioned. It was found on ex-

amination of the cases of hip disease, that the deformity was that of moderate adduction and flexion from 120 to 160 degrees in every instance. Under an anesthetic, it was found that in only two cases did the thigh come down into extension and abduction without the employment of steady traction. In other words, there was decided resistance to the correction of the deformity in all but two cases. This fact seemed to discourage the hope that any further gain could be effected by means of traction in bed. The disease in all of these cases, however, was not in an active stage. The result has been, therefore, that all of these cases of hip disease are now up and wearing plaster of Paris spicas with the thigh in, or nearly in, complete extension, and ten or fifteen degrees of abduction. In every instance there has been a decided gain in weight and general appearance and condition, with no return of active symptoms, and all the children are attending school daily, and are up and down about the porches and on the beach. On Christmas Day only one child was in the position of recumbency on a frame, with subacute symptoms and a lesion at the third dorsal vertebra. All the other cases in the hospital which were up and about were in a satisfactory condition. The use of the Whitman modification of the Bradford frame has been limited to those cases under the age of four, in those cases which show a presence of active symptoms not relieved by ambulatory means, and for those cases which presented pressure symptoms. In those cases of high dorsal and cervical disease, the further modification of the Whitman frame has been used with decided success, that is, a drop of two to three inches at right angles at the point of the disease.

Tuberculosis of the lungs in any stage has been a bar to admission to Sea Breeze Hospital and if at any time pronounced pulmonary symptoms appear, the child is discharged, since it has been observed that these cases do not do well at the sea shore. In considering the discharge of each patient it seems wise to discharge them with a note that the disease has been arrested, and consider them as such until time has proved them cured. Before discharge, in cases of arrested disease, each child is kept under observation for several weeks without support of any sort, and upon discharge, the child's parents, or those assuming its care, are instructed to bring him or her at frequent intervals to the attending surgeon for examination. In the last three years more careful following up of the cases has been carried out by the A. I. C. P., and with decided benefit. It has been noted that although the disease has not returned, the children often-times fail in their general condition because of the return to home surroundings. The report frequently comes from the parents that the children lose weight and have little

appetite after they return home, and the children complain that the reason is that the food is not so good at home.

The A. I. C. P., therefore, has followed up these cases and supplied fresh milk and eggs to those most needing them. The problem confronts all of us in the after care of these cases to care adequately for these children after they have left an institution where such ideal hygienic surroundings obtain. It is of the utmost importance in maintaining the greatest number of cures that as nearly as possible the same splendid conditions of food and hygiene should be offered the children in order that a recurrence of the disease may not occur.

#### DISCUSSION.

DR. RYERSON. I want to speak of two points on which I disagree with the reader. One is about the treatment of tuberculous abscesses. I have treated tuberculous abscesses in every way suggested, so far as I know, and I am at the present time absolutely opposed to the method of cutting into a tuberculous abscess. I have seen a large number of abscesses incised and sewed up, and the majority of them formed sinuses and became infected. I think aspiration should be the only operative resort in these cases so long as the abscess remains uncontaminated by other germs.

The other point is concerning the treatment of joint cases with tuberculosis of the lungs. It will surprise you, I am sure, if you have all your joint cases gone over carefully by medical men, to find how many of them have tuberculous lung lesions which were not suspected; and to my mind, it is just these cases that should be kept in our hospitals. It is the custom in the two children's hospitals in Chicago to discharge immediately any unfortunate child that has lung symptoms. These cases should not be discharged. They should be kept in separate departments of the hospital but should be carefully treated, both orthopedically and generally.

DR. ORR. Dr. Ryerson's point in regard to treating these patients that have tuberculosis of the lungs is important. We make it a point to keep all children in bed, giving them the same care recommended for tuberculosis of the lungs, when they have an afternoon temperature. They get well much more rapidly and much more surely with that kind of treatment. Someone said yesterday that he lets his patients out of the hospital in 22 days, which is too short a time. In the last two years in our work we have turned our patients out just as rapidly as we can, and 550 patients have had an average residence of 152 days, and that is not long enough.

DR. TAYLOR. We have not found the evacuation and drainage of abscesses to be unsatisfactory. The incision and sewing up of abscesses is still practiced at the Hospital for Ruptured and Crippled, but the abscesses usually refill and break down and the method is not to be commended. When these abscesses are easily accessible they should be evacuated through a moderate sized incision, and the incision should be kept open and the skin kept clean. The best way to keep the skin clean is to change the dressing frequently and wash it with alcohol.

Another great advantage is the sunlight treatment. We have been using it for two years at the Southampton Fresh Air Home with remarkably good effect both in the sinus cases and the closed cases. We have two cages covered with

wire netting to keep out the flies, and the children stay in these cages six hours a day on sunny days with most beneficial results. We now have records for nine years at the home, and the average gain has been seven pounds per year per child. In order to appreciate these figures it should be remembered that the average weight of each child is about fifty pounds.

**DR. GEIST.** I rise to disagree with Dr. Taylor. I think it would be very unfortunate teaching if we orthopedic men advised incision of tuberculous abscesses. We see so much of this done by general surgeons, with such disastrous results, that I believe it would be very unfortunate if the idea emanated from this Association. The danger of mixed infection is ever present in the hands of the best of us; it always occurs sooner or later.

I have never incised a tuberculous abscess and have never been sorry for the fact. I have always aspirated, very often at frequent intervals.

In regard to the treatment of tuberculous joints by sunlight (Rollier), would state that in our northern climate it is difficult to follow out exactly the technic of Rollier on account of climatic conditions. At the time of the Toronto meeting, Dr. McKenzie showed a great many cases of tuberculous joints being treated in the open air, and special attention was given by him to the effect of the sun's rays on the particular body area affected.

Ever since this visit to Toronto I have been in the habit of advising my patients to expose the affected joint to the direct rays of the sun as much as possible, this especially when the tuberculous process has affected the regions of the ankle, wrists and knees. I believe that I have observed a marked difference in results since adopting this method.

I believe Dr. McKenzie ought to be given credit for teaching the importance of the direct rays of the sun in joint tuberculosis long before the Rollier method was mentioned in our literature.

I should like to ask Dr. McKenzie to say something on the subject.

**DR. MCKENZIE.** It was quite largely by accident fifteen years ago we began putting these patients out of doors, and it was a mere accident that we found the improvement in the cases so great that we continued, increasing it until all our cases of tuberculosis are now out of doors as much as can be both winter and summer. For some years we kept them in tents both winter and summer at night, but that proved too expensive for the hospital, and now we keep them indoors in winter, but exposed to the sunlight as much as possible. Without being able to prove it by figures, I think that the treatment of tuberculous joint disease may be reduced to half the time by long continued exposure to direct sunlight. One thing I want to emphasize is the importance of direct exposure, so that the very fullest effect may be obtained.

Dr. Whitbeck laid a great deal of stress on sea bathing. I cannot dispute that but I wonder if he did not get his good results, not so much by sea bathing as by the sun exposure.

**DR. RIDLON.** It seems to me that none of us seem to realize that a patient with tuberculous joints is a tuberculous patient, and that tuberculous joints, with or without abscess, cannot be cured and with certainty kept cured until the patient is cured of tuberculosis. To expose a wrist to the sunlight is a very little, insufficient thing, because if you cure the tuberculosis in the wrist, you do not cure the patient of tuberculosis. The whole patient must be cured.

**DR. RYERSON.** Will Dr. Ridlon present his views on the treatment of tuberculous abscesses?

**DR. RIDLON.** Twenty-seven years at the game, and have tried all the things I have heard about, and I would rather have a child of mine, or a grandchild, never see a doctor, I would rather have the child left entirely alone, than have a doctor do anything to a tuberculous abscess or sinus coming from tuberculous abscess.

**DR. MCKENZIE.** Dr. Ridlon cannot mean by that, exposure to sunlight.

**DR. RIDLON.** You are not touching them by exposure to sunlight, you are not squirting anything into them.

**DR. WHITBECK,** closing discussion. In regard to the treatment of abscesses, I have been afraid to open them and leave in a drain for fear of a greater danger toward infection. I have found, however, that with care, I have not caused infection and breaking down of the abscess any more frequently by incision and sewing up than by aspiration. Incision has the advantage of getting rid of the broken down material as well as the pus, and it is for that reason that I have preferred incision.

Regarding the lung cases, I do not want it to be assumed that when we discharge one of these patients that we throw them out. They are sent away from the seashore to a home in the country, because we have found they do not do so well at the seashore as in the country. That is a serious complication, and personally I would rather send these cases to the mountains where they do much better. We have a medical man in charge of these cases and out of the 43 there now, we have only two cases of suspected pulmonary complications. We do not find a large per cent. of them have pulmonary complications.

**DR. McKENZIE** spoke about the benefits of the sea bathing possibly not being so efficacious as sun exposure. The hospital has been open for ten years. Heliotherapy was introduced only two years ago, and in the eight years preceding it we realized from the start that these cases did well and the sinuses improved with the sea bathing. The water of Coney Island is dirty, you cannot find worse water in the United States than there, but it has seemed to help decidedly.



A STATISTICAL STUDY OF 539 CASES OF POTT'S DISEASE  
TREATED BY THE BONE GRAFT.

BY FRED H. ALBEE, M.D., NEW YORK.

WITH the object of securing the results obtained by others with the bone graft treatment of Pott's disease, a large number of printed question blanks were sent to surgeons in this and foreign countries who had performed this operation. The writer takes this opportunity to thank those who have made this statistical report possible by their trouble in looking up their cases and filling out the blanks.

Thirty-three surgeons reported a total of 299 results, in 229 of which the disease was pronounced arrested; in 59 the condition was improved. Twelve of the 299 patients died, four of these fatalities being reported as due to shock. The remaining eight cases died in four months or longer after the operation, either from complications or from intercurrent diseases. In five of these cases the symptoms from spinal disease were entirely controlled. In three of the four cases in which death was due to shock, the chisel and mallet were used to obtain the grafts.

Sixteen of the thirty-three surgeons reported 100 per cent. of the cases as disease arrested. Ten surgeons reported that they did not use plaster jackets or spinal support beyond the period of immediate post-operative recumbency. Nine of these men reported 100 per cent. of cases of disease arrested, and one secured 88 per cent. of good results.

Of the author's personal cases, only those that have been operated upon one year or longer are included in this report. There are 198 of these; in 184 the disease was arrested; in two there was improvement. To date, 12 have died. Six of these 12 were entirely relieved of their Pott's disease symptoms and died of some intercurrent disease. One, a child of six years, in poor general condition after five years of unsuccessful conservative treatment, died the next day after the operation. In this case the chisel and mallet were used to remove the graft. The cause of death was unknown. One case died of acetonuria on the fourth day, one from status lymphaticus. Another case died two years after the operation from a suppurative meningitis complicating a middle ear disease and following an injury to the skull from a blow of a stone. An

autopsy of this case by Dr. Otto Schultz demonstrated a complete cure of the tuberculous spine. One case died of pneumonia one week after operation. The causes of death in the remaining cases have been amyloid degeneration of the viscera, tuberculosis of the lung, and an acute abdominal condition.

Only three cases of the 539 have died of tuberculous meningitis. In no case has there been any trouble with the tibia from which the graft was removed.

The ages of the patients varied from twenty months to sixty-five years. The duration of the disease varied very widely, and this was in many cases synchronous with the duration of the previous unsatisfactory conservative treatment.

There were 61 cases of less than 1 year's duration.

73	"	"	over	1	"	"
64	"	"	"	2	"	"
71	"	"	"	3	"	"
56	"	"	"	4	"	"
36	"	"	"	5	"	"
33	"	"	"	6	"	"
21	"	"	"	7	"	"
16	"	"	"	8	"	"
13	"	"	"	9	"	"
10	"	"	"	10	"	"
8	"	"	"	11	"	"
8	"	"	"	12	"	"
5	"	"	"	15	"	"
3	"	"	"	19	"	"
5	"	"	"	21	"	"
2	"	"	"	26	"	"

Of the total 539 cases, the disease was arrested in 460; in 59, the condition was improved; in 20, the condition was unimproved.

There were nine deaths after operation. In six instances death occurred long after operation and after all spinal symptoms were entirely relieved.

The percentage of results of disease arrested ( $85\frac{1}{4}\%$ ) in this large number of cases is most gratifying, especially when it is realized that most of these cases were operated and treated during a period when the technic of the procedure and the necessary electro-operative instruments were in the early stages of their development. When the author's present perfected motor tools and technic are employed, it is believed that a fatality from operative shock should never occur.

When the operation is done early, before the development of a deformity, it can be—and has been on several occasions—performed in as short a time as fifteen minutes. Fewer vertebrae are included, and this is an additional argument for early operation.

Several cases operated in other clinics have come under the writer's observation, in which an x-ray study has demonstrated that the graft was either much too short, or was placed in the wrong vertebrae, or was so inserted as to allow a lateral displacement of the graft. It is, of course, needless to state that in such cases the results were unsatisfactory until the faulty conditions were rectified by a second operation.

It has also been very gratifying to learn that the percentage of results has been so high, in spite of the fact that many of the author's cases, as well as those of his colleagues, were so unfavorable at the start, in that the disease had existed for so long a time. The operation was resorted to because the cases had failed to respond to all kinds of conservative treatment, and in many instances had been complicated by abscesses, paraplegia, or septic sinuses. Certain men have reserved the use of the bone graft for such cases only, and have continued the plaster jacket treatment in all early or favorable cases.

Another influence which it seems certain has materially interfered with the attainment of the highest percentage of good results from the bone graft by certain men, is a mistaken diagnosis. The importance of an early and correct diagnosis cannot be emphasized too strongly.

Six cases of infectious arthritis, in each instance involving practically the entire spine, have come to the writer with the statement that they had been advised to have a bone graft inserted. Four of the patients had given consent for the operation to be performed, and came to me for the operation rather than to the surgeon who had advised the procedure. One case was that of a young woman who had worn a well fitted spinal brace with a chin cup for several months. She consulted a surgeon who made all the arrangements to do the operation, including the hospital accommodations, etc. The family then decided to come to New York and consult the writer, as he was the originator of the operation. A thorough examination was made and was confirmed later by a well-known orthopedic surgeon, and revealed an antrum of Highmore full of pus, and a secondary infectious arthritis involving the whole spine from the occiput to the coccyx. It is obvious that if the bone graft had been inserted in this case, as advised, it could have had no influence whatsoever on the lesion present.

Two cases came into my office on the same day, bringing skiagrams and typewritten statements from radiologists that these patients were

suffering from Pott's disease of the spine. One was a sacro-iliac case and the other was a neurotic spine. Both cases responded to the appropriate conservative treatment. The bone graft had been suggested to both of them.

Another case of interest was that of a woman, forty-five years of age, from a distant state, whose brother consulted me concerning the advisability of her coming to New York for operation. He stated that a diagnosis of Pott's disease of the spine had been made and that she had worn plaster of Paris jackets for six years without relief. The brother, who was to pay for the operation, made arrangements for hospital reservation, as well as to inquire the operative fee. The patient finally arrived, and upon removing the well-applied plaster of Paris jacket, it was a great surprise to find a very exaggerated neurotic spine, which entirely cleared up under a long continued treatment of high frequency current and suggestion.

Every diagnosis of Pott's disease should be confirmed by an x-ray examination, which should include an antero-posterior view as well as a lateral or an oblique lateral. The disintegration and the crushing of the vertebral bodies should always be demonstrated before advising the operation. This is necessary not only to confirm the diagnosis, but it is most imperative to determine the number and the particular vertebrae involved, so that the graft can be correctly placed.

#### DISCUSSION OF PAPERS OF DRS. HAWLEY,<sup>1</sup> RUGH,<sup>2</sup> AND ALBEE.

DR. GALLIE. I am very glad of the opportunity of congratulating Dr. Albee on the excellence of the results which have attended the further exploitation of the ingenious method of treatment of Pott's disease, of which he is the originator. In support of the clinical records of the success attending the treatment, I have recently been able to demonstrate the correctness of Dr. Albee's contentions at autopsy. With your permission, I shall show the specimen, which I am sure you will find interesting.

The patient was a girl of six years upon whom I operated some two years ago. The technic employed was exactly that recommended except that the graft was devoid of periosteum. The patient died a year later of tuberculous meningitis and I was able to obtain the spine at autopsy. As you see, the spines are securely locked together by the bar of bone which is fused to the spines without any evident line of junction. Whereas the graft was originally the hard, compact bone of the crest of the tibia, it is now changed to cancellous bone of the same structure as that of the spines. The fixation against motion provided by the graft is complete and the protection against the increase in deformity must be better than that provided by any form of external splinting. At any rate, no increase in the deformity took place in this patient during the year.

<sup>1</sup> A Contribution to the Fate of Bone Grafts, AM. JNL. ORTH. SURG., Jan., 1916.

<sup>2</sup> Bone-Grafting for Spinal Conditions, AM. JNL. ORTH. SURG., Feb., 1916.

## ILLUSTRATING GALLIE'S DISCUSSION OF ALBEE'S PAPER.



FIG. 1.

Sagittal section of tuberculous spine, showing spinal graft one year after operation.



FIG. 2.

Low-power photograph of section of spinal graft, recovered four weeks after the operation, showing the restoration of the circulation and the absence of bone cells.

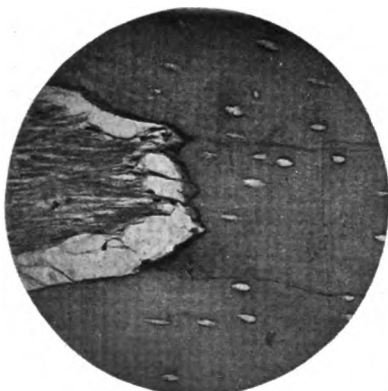


FIG. 3.

High-power photograph of section of spinal graft, recovered four weeks after the operation, showing the restoration of the circulation and the absence of bone cells from the lacunae.



FIG. 4.

High-power photograph of section of the spinal graft, recovered one year after the operation, showing the complete replacement of the old tibial bone by living bone. The lacunae in this bone contain living bone cells.

Another interesting point illustrated by this specimen is in relation to the histological changes occurring in the graft. Owing to the fact that when the operation was performed, the graft was too straight for the degree of kyphosis present, it was necessary to do a secondary operation four weeks after the first one to clip off the sharp ends of the graft which were beginning to cut through the skin. In cutting off the pieces of bone, it was interesting to observe that the graft bled freely and had all the appearance of living bone. What was my surprise to find, on having the bone sectioned, that it was dead. The circulation had been completely reestablished, but not a living bone cell could be seen.

A few years later, however, the histological picture had been completely changed. Now there is no sign of dead bone, all the old dead bone of the graft having been completely replaced by the ingrowth of new bone from the spines.

From sections such as these, I have concluded, as you know, that the compact bone of transplants dies immediately upon separation from the blood supply, and while a few cells on the surface may live, as many writers have demonstrated, nevertheless, a graft depends for its usefulness on the ingrowth from neighboring living bone tissue.

The obvious deduction from such histological findings is that boiled bone might be utilized for spinal grafts. I have done this operation on several occasions, both in humans and in animals, using sometimes human bone and sometimes bone from other animals, and as far as I can see, with results identical with those obtained from the technic of Albee. I shall make a definite report on the results of this modification of the operation next year, but in the meantime I have great hope that the operation of spinal grafting can be much simplified by the use of bone prepared in advance of the operation, making certain of the correctness of the size and shape of the graft, and clinically obviating the necessity of the second incision. To those who doubt the ability of boiled bone to act in the same way as the so-called autogenous graft, this slide will be interesting.

DR. GALLOWAY. My work in bone grafting began three years ago, after seeing Dr. Albee operate in New York, and I have done since then between 70 and 80 bone graftings, chiefly for Pott's disease of the spine. The first operation I saw, I reached the conclusion that if the patient were myself or my child, I should insist on the operation being performed. I agree with Dr. Rugh in his statement that he does not like operating on a young child as well as on an older one. My youngest patient was two years, ten months, my oldest, 74 years. In the latter case, the patient had undoubtedly had disease of the lumbo-sacral region early in life, and at the age of 74 had developed a new focus of activity in the dorso-lumbar region. After operation, the patient made an excellent recovery, but several months later died of tuberculous meningitis.

The reason I do not like to operate on young children is that, of the three deaths I have had, two were young children. One was two years, ten months, and the other three years, two months, both of whom died within two hours. I have operated on young children since without any fatalities and attribute my former fatalities to the fact that I did not fully appreciate the risk from hemorrhage. I now use adrenalin in the spinal wound to prevent loss of blood. I would say in regard to the cases occurring in very young children, I would now be inclined to treat these by other means until the age of five, and after that, even if the disease were apparently cured, I would use a graft as protection against relapse in the future.

I keep all my patients in bed ten weeks. Contrary to Dr. Albee's teaching, I have not felt willing to allow them to be up until after ten weeks. Some of them go without protection from the time they are up, but in most of them I

put on a jacket and kept it on for three months and in many I repeat the jacket and have it kept on for another three months so as to have six months' protection.

I have operated on several cases in which there was distinct paraplegia. In some of these cases there has been immediate improvement and in about an equal number there has been aggravation of the paralysis. In two cases I am discouraged at the present time regarding the final recovery from paralysis. I am using longer and longer grafts, fixing a greater number of vertebrae, nearly always taking as much graft as I can get. In four of my earlier cases, when I used a chisel for removing the graft, I fractured the tibia, but none of the patients knew I did it, and they recovered nicely. I have had no fractures since using the motor saw.

DR. PORTER. I had one experience that I want to mention to see if anyone has had a similar one. I operated upon one case of Pott's disease of the lumbar spine in a strange hospital and with instruments not my own. I used for the purpose of splitting the spinous processes a chisel narrower than the one I ordinarily use and I accidentally drove one corner of the chisel through the interspinous ligament, and I noticed some spinal fluid in the wound. It was a very little amount and did not attract the attention of anyone else. The patient made a beautiful recovery, but at the end of four weeks began to develop hydrocephalus and has kept on.

DR. PLUMMER. I have recovered one specimen from an adult treated in this way for Pott's disease.

A thirty year old adult with first lumbar Pott's, presented in the hospital. He had a history of disease for three years, with small kyphos. He seemed to present a picture of beginning tuberculous meningitis. After two months of recumbency he apparently recovered and an Albee graft including six vertebrae was done. He made an uninterrupted recovery, clean wound etc., for ten weeks. At this time he showed signs of meningitis and died in two weeks. No autopsy was permitted, but a spinal specimen was recovered which showed that the disease had not invaded the operative field, and the graft appeared on section to be vascularized. The graft showed in x-ray of specimen new bone at points of contact with spine. Sections showed incomplete bone formation, and much scar tissue. The graft was firmly fixed but did not absolutely prevent torsion of the spine. This would suggest the necessity for longer fixation periods than proposed in the original technic.

DR. RYERSON. I did not report to Dr. Albee my series, because I did not have time. I have done this operation 52 times. I have had four deaths in my series, two from late rupture of a mediastinal abscess into the operative site and subsequent infection, from which the children died after many months. The other two died about thirty hours after the operation. There was no sign of discomfort, and they were apparently normal, but within thirty hours they began to have great difficulty in breathing, not like the breathing of pneumonia, but an "air-hunger." A search was made for acetone but none developed. I have since had two other cases, one a club foot and one a silk ligament suspension, who died in the same way. In the club foot case we found fat embolism of the lungs. This is not surprising when you consider that the medullary content of the bone is about 95% fat, and we have done nothing to prevent fat embolism, and these operations must favor it.

It occurred to me that a tourniquet applied for as long a period as possible around the leg might allow clotting in the vessels around the marrow, thus preventing the occurrence of this distressing complication. There is no objection

to leaving a tourniquet on for three quarters of an hour after operation, and in none of these cases where I have had the tourniquet applied has there been any fat embolism. Dr. H. G. Wells, of the University of Chicago, is making animal experiments to determine the value of this method of prevention, and a report will be made at a future time concerning it.

**DR. FREIBERG.** My experience with plastic operations on the spine for tuberculous disease has been small. I have operated thus far on very few cases. I was much interested to note from Dr. Galloway, that two of his were cases of paraplegia in which there was no evidence of abscess about the spine. I think it is timely to issue a warning against doing a plastic operation on the spine when paraplegia is present with abscess about the spine. This is for the reason that it seems fair to assume that abscesses and paraplegia are in relationship to each other, and there is no occasion for hurrying while this exists, and on the other hand there may be danger.

I have had one case, a woman twenty-six years of age, in whom there was paraplegia of six months' duration, with abscess around the spine. Instead of operating on this woman at the time, I allowed her to get well of her paraplegia first by fixation, before I did my bone graft on the spine. She did recover from the paraplegia in two months, and I then proceeded to do the bone graft operation. There seems no reason why this should not be the normal course of procedure under such circumstances.

**DR. SHAFFER.** I have a case I should like to relate. I was asked to see a girl about fifteen, and both she and her mother gave a positive Wassermann reaction. The X-ray showed more globular tumor than tuberculous spondylitis. She had complete paralysis, sensory also. I saw the patient and looked forward to a long illness without any favorable results and suggested laminectomy. I lost sight of the case for a while and afterward found the doctor had performed this operation and the result was magical. The girl has apparently completely recovered. Of course along with the other treatment she has had salvarsan.

**DR. GAENSLER.** Dr. Brackett a few years ago, in a very interesting article, classified tuberculosis of the spine in two groups: (1) those in which the mechanical function of the spinal column is interfered with, and (2) those in which the protective function of the column is impaired. In the former, the lesion occupies the anterior portion of the bodies of the vertebrae; there is early kyphosis and pain is not a prominent symptom. In the latter, the lesion is in the posterior portion of the vertebral body; root symptoms are early, marked and persistent, and kyphosis is very late. From my experience with the latter type, it would seem that the benefits to be derived from spine grafting are less certain than in the type in which the mechanical function is the one principally disturbed. This is what one would logically expect; fixation will be of greater value where mechanics is the greatest factor.

In one case of the second type referred to, with marked root symptoms and absence of kyphosis, temporary relief followed fixation of the spine by Albee's method, but the symptoms recurred so that a second graft was placed below the first, and still later, a third graft was inserted, reinforcing the junction between the first two. The ultimate outcome is problematical since the last operation is of recent date.

**DR. BAER.** My experience with bone grafts has been very small compared to the number of cases that Dr. Albee has done, but I would divide them into two distinct classes, one of which has done well, and another which has not, in my



hands, done well at all. The cases which have done well are the cases which are older from the point of view of infection and age. In children I have had no success whatever. Between the ages of two and eight, I have done only about twenty-three. I have followed the Albee technic, but have put on plaster jackets after operation and kept the patient in bed for from eight to ten weeks. Every one of those cases has recurred so far as pain and symptoms are concerned. Therefore, my experience with young children has not been gratifying.

DR. DAVIS. I have had a considerable number of these operations. One I lost from tuberculous meningitis and soon after another case was lost by one of my assistants. From the two cases dying of tuberculous meningitis, I was very much afraid it would be a serious complication, and I am glad to see from Dr. Albee's statistics that it does not seem a thing greatly to be feared. I had trouble with tuberculous meningitis, Dr. Ryerson with fat embolism, and perhaps some one else is having some other trouble. Then comes the question of whether it is desirable to do this operation. I think it is, in view of the statistics submitted. I think tuberculosis is such a terrible disease that very radical measures are justified in order to secure permanent results.

As regards the question of paralytic cases, I think I have had three or four. If you will look up the statistics you will find the beneficial results in those paralyzed cases have been so marked as to justify proceedings. I do not like to operate on young children, as Dr. Baer has remarked. All of mine were over four or five, and I have kept them in bed for six weeks and then put on a light wire frame for support for a year afterward.

DR. BLODGETT. I should like to ask how far it is wise to keep the patient on the back. My own series is small, about fifteen, but I have noticed that sinus formation is greatly increased by keeping the patient on the back. Since we have allowed the patients to be turned on the side, or on the stomach, they have been more comfortable, and we have had no trouble with sinus formation.

## RESULTS OF NON-OPERATIVE TREATMENT OF INFANTILE PARALYSIS.

BY ARCHER O'REILLY, M.D., F.A.C.S., ST. LOUIS, MO.

THIS paper is based on a study of the cases of infantile paralysis treated at the Out-Patient Clinic of the St. Louis Children's Hospital, and the Washington University Medical School. Its object is to outline briefly the methods of treatment and their results.

The non-operative treatment, as followed at the Clinic, has been based on the belief, expressed by a number of authors, that in many cases the residual paralysis is the result of prolonged muscle strain with resulting exhaustion, and that if these muscles are allowed to rest, they recover. All cases seen are treated for several months, at least, before any question of operation is considered. If, at that time, any regeneration has appeared, the question of operative interference is postponed until all improvement has ceased. In this way we hope to avoid injury to muscles that may regenerate.

There is nothing new or original in the treatment followed. It is based on the methods that we have found most suitable and satisfactory in our Clinic. The vast majority of cases seen were of paralysis of lower extremity. Those of the upper have been operated upon and do not come under the head of this paper. The few cases of paralysis of the spinal muscles seen, presented such a marked degree of structural scoliosis that they are being treated for that condition.

As soon as seen, the muscles are put in equilibrium and all strain is removed from the weak or paralyzed muscles. In some cases where the weakness is slight, this is accomplished by raising the inner or outer edge of the shoe. In the majority of cases, however, a brace is applied. Originally the brace was attached to the shoe, instead of a sole plate, which is cumbersome. This method was found to be unsatisfactory, as the shoe on the paralyzed foot was usually much too large, and it did not hold the foot in the proper position. For the last two years, we have been using sandals, which have the advantage of being light; the position of the foot can then be constantly seen and by the use of a couple of additional straps, it can be securely held in position.

Any deformity due to contractures which does not yield to stretching, is corrected by tenotomies. This simple procedure is not counted as an

operation for the purposes of this paper, as it is necessary to relieve overstretched muscles in this way before any improvement can be expected.

The patients come to the Clinic three days a week for massage and muscle training, and the mothers are instructed how to massage them on the other days. The children are also given exercises for the muscles. The work is under our direct supervision, and is done by a trained masseuse. Those cases who do not attend regularly are looked up by the Social Service Department, and if the parents are unable to come, the children are brought in by a volunteer worker.

TABLE I.

Total number of cases seen .....	114
Lost cases (not treated) .....	68
Cases treated .....	46
Cases massaged and exercised .....	35
Acute cases (under one year) .....	24
Chronic cases (over one year's duration) .....	22
Acute cases improved .....	11 or 46%
Chronic cases improved .....	9 or 41%
Cases massaged improved .....	15 or 43%
Improved cases not massaged .....	5 or 45%
Cases not improved .....	26 or 56%

Since the first of January, 1912, we have treated 114 cases of infantile paralysis that have not been operated upon. Of this number, 68 were seen only once or came to the Clinic for such a short time that they practically received no treatment, and we have been able to receive no further report from them. Forty-six cases have attended the Clinic regularly so that some opinion may be formed as to the efficiency of treatment. Of these cases, 35 have received massage regularly. There were 24 cases that might be classified as acute, cases that were seen within one year after the onset of the disease; and 22 chronic cases seen one year or more after the onset of the disease. In the group of acute cases, 11, or 46%, showed some improvement, while of the chronic cases, 9, or 41%, showed some improvement; and 15, or 43% of those cases receiving massage and exercises improved. Eleven cases were treated without massage and exercise, and of these, 5, or 45%, improved. Fifty-six per cent. of the cases treated showed no improvement.

A study of these statistics brings out several suggestive points. The first is the difficulty of inducing patients to attend the Clinic long enough to derive some benefit from the treatment. Some of the patients were probably discouraged at the prognosis given and went to some other

clinic in the hope of a better one, and probably remained there; others possibly improved, but judging from replies to letters sent to all these patients, I rather doubt it.

An interesting point is the close correspondence in the percentages of improvement. One would expect the improvement in the acute cases to be fairly high, especially as several of these were in the early acute stage. It is surprising, however, to find that these cases treated only by braces and plaster supports, showed a larger percentage of improvement than those treated also by massage and exercise. Of course the number of these cases is not large and, for that reason, is not of great importance.

The most discouraging feature is the large percentage of cases that showed no improvement. In all cases, of course, the patients were helped by braces and were able to get about with much more comfort, but in none was there any improvement in the amount of the paralysis. It is also made more disheartening because in those cases in which improvement did occur there was no remarkable gain in muscle power.

From the analysis of our work I believe that the following conclusions may be drawn:

It is very difficult to treat infantile paralysis non-operatively in an out-patient clinic, owing to the difficulty of inducing the patients to attend regularly for any length of time. This seems to be the case even in a clinic where the patients are followed carefully by an efficient social service department.

From 40% to 45% of the cases show some improvement when treated by braces, and this percentage is not materially increased by the use of massage.

Improvement in all cases in which it was noted was not great, and in our experience recovery of muscle power in stretched and exhausted muscles seems to be slight.

In the majority of cases no improvement took place after six months, especially in the more severe cases.

From our experience I believe that one is safe in operating on any case in infantile paralysis after the first year and I believe that this should be done in suitable cases. The patients are then more easily induced to come to the Clinic and the end results are more satisfactory.

## CERVICAL RIBS, REPORT OF SEVEN CASES WITH ONE OPERATIVE CASE.

BY W. W. PLUMMER, M.D., BUFFALO, N. Y.

THE marked development of the efficiency of the modern technic of Roentgenology has served to take the subject of cervical ribs out of the realm of anatomical rarities, and put it in the class of well recognized congenital deformities associated with a definite train of clinical signs. This fact, coupled with a general improvement in the matter of systematic and careful examinations of patients presenting a variety of symptoms referable to the upper extremities, has placed in the available literature a record of a quite considerable number of cases observed and treated by men in this country and abroad.

It is no part of this paper to attempt a review of the literature, but the reader is referred to the articles of Marie on the subject in hand, and to an excellent and comprehensive report of cases by Henderson in the last volume of the "Mayo Clinics." The writer's purpose is simply to report a personal experience of seven cases, hitherto unpublished, with comments on the clinical findings.

Cervical ribs have been observed as unilateral, or double, usually related to the seventh cervical vertebra, and varying in size and completeness from a fully developed rib with articulations and muscle attachments, down to a mere enlargement or overgrowth of the costal process of the vertebral unit. The commonest clinical evidence of the presence of the extra rib has been, in the cases recorded, a neural disturbance in the arm associated with pain, or pain and varying degrees of paralysis referable to the distribution of the ulnar nerve, and suggesting pressure on or injury to the eighth cervical root. Less frequently disturbances in the circulation of the upper extremity, and spinal deviations have been observed. Apparently the size and shape of the rib do not bear any definite relation to the intensity of the symptoms produced, as it has been noted that some of the larger ribs have caused little or no trouble, and in some of the bilateral cases the neural signs have been found on the side of the rudimentary growth. In fact, several of the cases reported by Henderson, and one of my own, were discovered in the course of routine examinations and had caused no

discomfort or annoyance of any sort to the patient. It is suggested that possibly the posture of the upper spine, in the presence of an extra rib or an enlarged costal process, is the direct cause of pressure upon and irritation of the closely related eighth root, and two of the cases about to be described will bear out this suggestion. In another case the presence of a cervical rib was unknown until an increase in the bulk of the tissue in the neck above the clavicle, the result of inflammatory infiltration of the lymph nodes of this region, had produced pressure in the already-constricted space.

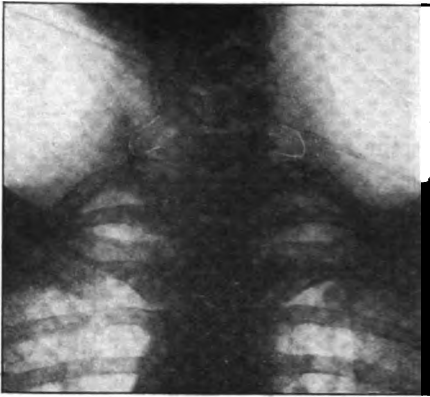
#### THE CASES.

CASE 1. A medical student, 20 years old, complained of frequent numbness and "going to sleep" in both hands. This was especially true when he assumed a position with arms raised in front of him, as in working at a bench or table. He had discovered, and demonstrated it to me, that by raising both arms, and strongly contracting his pectorals, the radial pulse would practically disappear. The x-ray showed right and left fully developed cervical ribs attached to the seventh cervical. They could be palpated, but produced no deformity. His case was untreated and present condition is unknown.

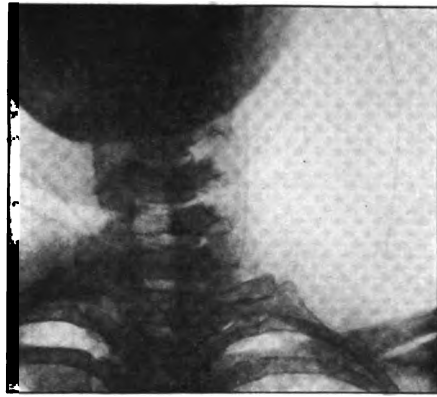
CASE 2. Mrs. C., age 37, had a history of frequent attacks of so-called "neuralgia" involving the fourth and fifth fingers of the right hand and extending over a period of several years. These attacks were more frequent and severe when she became overtired. She stood with a bad posture, round back and head drooping forward. X-ray showed enlarged costal processes of the seventh cervical, both sides. In the stereogram there was apparently very little space between this process and the one next below. For want of a better suggestion we started her on a course of postural exercise work to see if we could give her a better carriage. She did make improvement, and during the treatment the neural symptoms were much relieved. She did not maintain her posture and subsequently suffered a relapse.

CASE 3. Mrs. W., aged 32, a case with history and findings almost identical with Case 2. X-ray findings as above, but the symptoms were referred to the left side. Postural treatment was again tried, and in this case, because of the faithful coöperation of the patient, she has been almost completely free from pain for over a year.

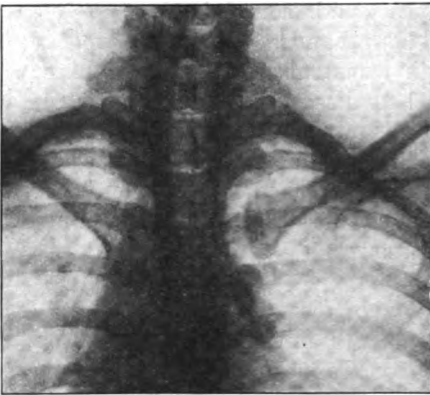
CASE 4. L. F., age 15. While examining this patient for a supposed goitre, her physician discovered a hard mass in each side of the neck behind the clavicles. The patient had a narrow, conical chest, carried



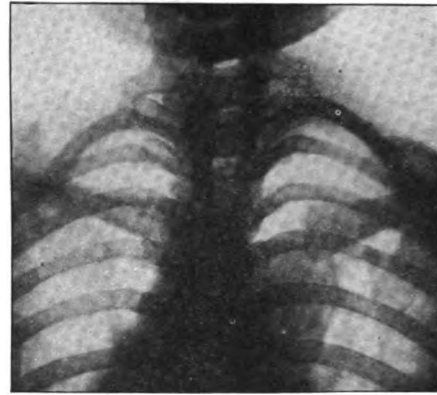
**FIG. 1. CASE 2.**  
Bilateral enlargement of costal process. Periodic pain in both arms. Round back posture.



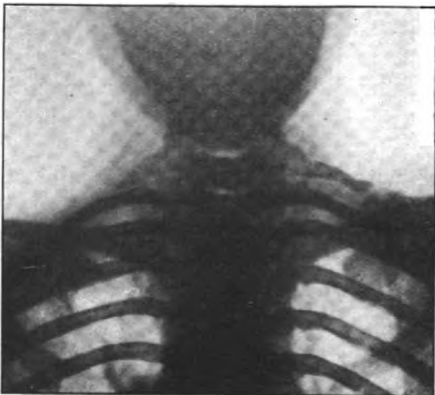
**FIG. 2. CASE 3.**  
Bilateral enlargement of both costal processes. Pain in right arm. Round back posture.



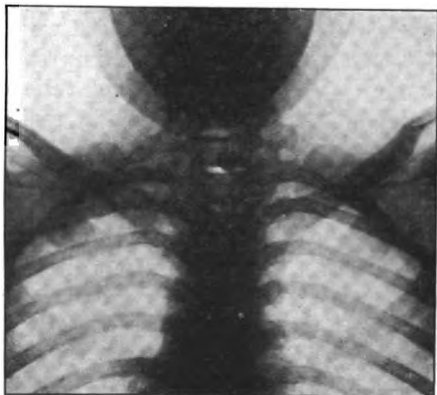
**FIG. 3. CASE 5.**  
Bilateral rudimentary cervical ribs. Ulnar paralysis left side following an acute adenitis in the left side of neck.



**FIG. 4. CASE 6.**  
Bilateral rudimentary ribs. Marked ulnar paralysis on side of longer rib.



**FIG. 5. CASE 7.**  
Double cervical ribs. Note articulation with first normal rib on right. Note scoliosis.



**FIG. 6. CASE 7.**  
Same case after operative removal of the rib.

the head forward, and the neck was much widened at its base. There was no goitre. The x-ray showed bilateral, well developed, seventh cervical ribs. No symptoms referable to the ribs.

CASE 5. Mrs. B., age 33. Following her first lactation, an abscess developed in the upper portion of her left breast. There was associated a marked and persistent adenitis of the nodes about the clavicle. This adenitis persisted for some time after the abscess was healed, and later pain and loss of power were noted in the left hand. There was a fairly well-marked atrophy of the muscles in the ulnar nerve area. The x-ray showed double cervical ribs of the rudimentary type. Following the subsidence of the adenitis the pain in the hand disappeared, but while improved, the hand, after a year, still shows atrophy and some loss of power. In this case it is suggested that pressure caused by the adenitis in a space already restricted by the extra rib, produced the injury to the nerve.

CASE 6. Miss. S., age 24, with a history extending over a year and a half, presented a case of well-marked ulnar paralysis, with pain and atrophy. The x-ray showed bilateral rudimentary cervical ribs. Operation suggested, but refused. Patient seen again after ten months, and marked increase of atrophy noted. Operation again refused.

CASE 7. C. F., a thirteen-year-old girl, presented at the clinic because of a lump in right side of neck behind the clavicle. No pain or paralysis, but a left cervico-dorsal scoliosis. Right-sided head motions restricted. The rib was easily palpated. The x-ray showed a rudimentary left cervical rib, and a fully developed right. The latter was apparently supported at its outer end by an upright outgrowth of bone arising from the region of the scalene tubercle of the first normal rib. Operation was proposed and accepted.

Operation: February 14, 1915, Children's Hospital, under ether. Through an incision parallel to and behind the clavicle the rib was exposed. Tightly drawn over the rib, the nerves were found, and the subclavian vessels lay between the previously described bone spur and the clavicle. The median and posterior scalenus muscles were attached to the upper border, and the pleura to the lower border of the rib. The right phrenic nerve was exposed during the dissection. There was a true articulation of the rib with its vertebral process, and in front with the overgrown scalene tubercle. The rib was removed *en masse*, and the tubercle cut from its base on the first normal rib. I am unable to explain the absence of neural symptoms in view of the findings above noted. The child made an uneventful recovery and there is now less restriction of head movements, but the scoliosis is unaltered.



## SUBUNGUAL EXOSTOSIS.

BY ARTHUR J. DAVIDSON, M.D., PHILADELPHIA.

Associate in Orthopedic Surgery, Jefferson Medical College; Assistant Orthopedic Surgeon,  
Jefferson Hospital; Orthopedic Surgeon, Jewish Hospital.

HAVING observed during the past few years five cases of painful enlargement of the distal extremity of the great toe due to a subungual exostosis, the condition seems sufficiently frequent to be worthy of description.

The cases observed, in each instance, were in young males under 30 years of age. All were seen in private practice. No history of injury or infection could be obtained in any case. The condition is comparatively slow in development, taking from six months to two years to acquire sufficient size to cause the patient to seek medical advice.

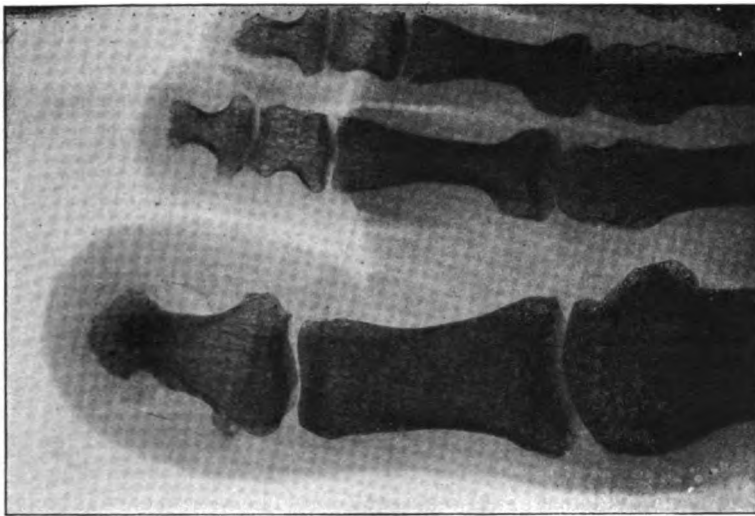
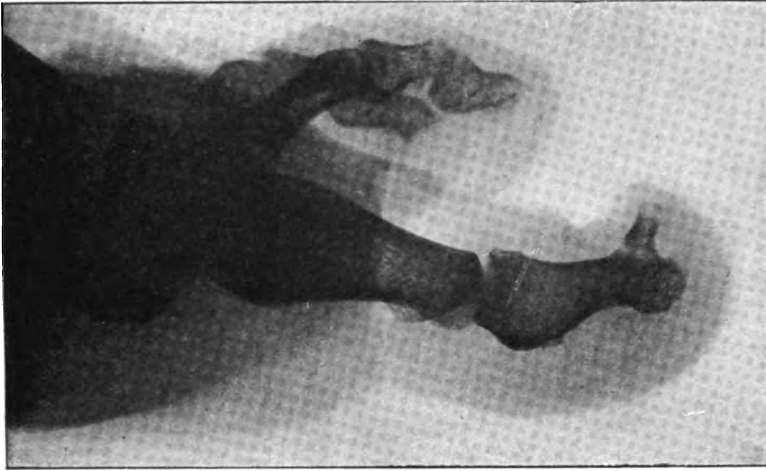
The patient first notices that the great toe nail is being raised from the usual flat position and there appears a hard growth from beneath the nail, which pushes the nail upward and backward. This growth increases very gradually in size until the nail becomes almost vertical in its axis. A condensation of the soft tissues takes place over and about the exostosis which gives the appearance and feeling of a small fibroid tumor. If allowed to persist untreated, the skin becomes very thin and finally ulcerates, leaving the tip of the bony spur exposed. A radiograph will show a cylindrical shaped exostosis arising from the dorsal surface of the distal phalanx near its most distal point.

The only efficient treatment consists in the removal of the spur. The incision employed is made transversely across the end of the toe on a level with the dorsal surface of the phalanx. A flap is lifted and the exostosis removed with a very small chisel from beneath the toe-nail; thus the matrix is not in any way injured and the future development of the nail is not impaired. The complete relief from pain with no recurrence has been the result.

The etiology of this interesting condition remains much in doubt. In a former contribution on exostoses,<sup>1</sup> in summing up their causes, the statement was made that all cases belong to one of three classes:

1. Those due to some direct infection.
2. Those due to direct trauma.
3. Static cases. Those associated with tendon or ligamentous strain.

In the cases referred to in this paper there was no history of infection of any kind, nor were there any inflammatory signs or evidences of disease of either the matrix of the nail, the bone, or of the soft parts. Exostoses of the variety described could not be credited to any associated



SUBUNGUAL EXOSTOSIS.

tendinous or ligamentous strain for the reason that no tendon or ligament is attached to the portion of bone from which the growth arises.

By excluding these possible explanations it brings us to a consideration of trauma. The location of the exostosis is at a point which is frequently the site of trivial injuries and which is being constantly subjected to the pressure of the stiff boxing of shoes. The usual atrophic conditions of the flexor muscles of the toes have the effect of increasing the power of

the extensors and thereby place the toes in the position to bear the brunt of this shoe pressure.

Regardless of the fact that no history of direct trauma could be obtained in any of the cases here recorded, it is quite possible that subungual exostoses are the result of trivial injuries or occur following the prolonged irritation of shoe pressure which may, or may not, be appreciated by the patient.

<sup>1</sup> Exostoses of the Os Calcis. *Therapeutic Gazette*, April 15, 1911.

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## OLD DISLOCATION OF THE CLAVICLE IN A CHILD.

BY C. H. BALDWIN, M.D., UTICA, N. Y.

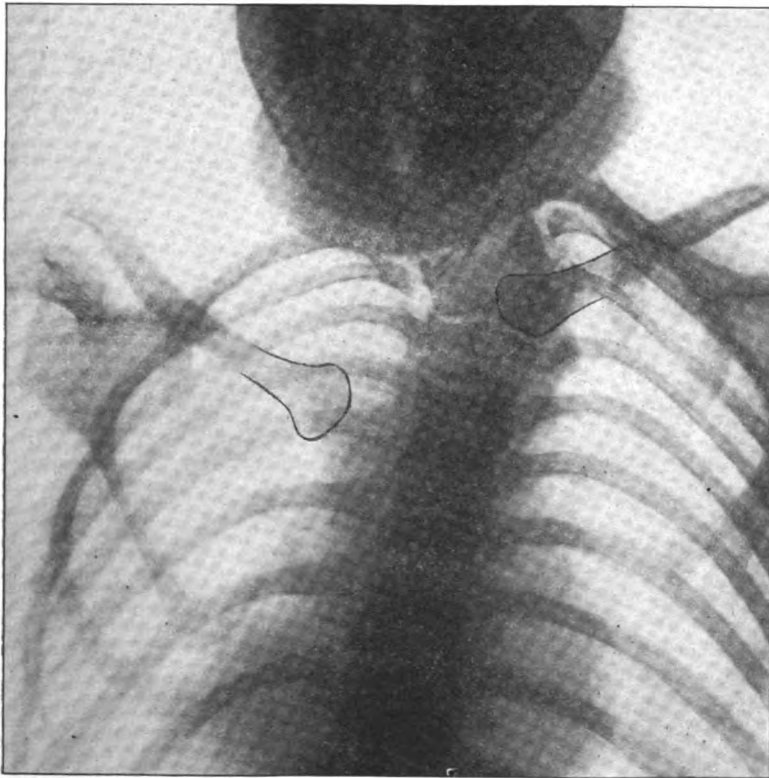
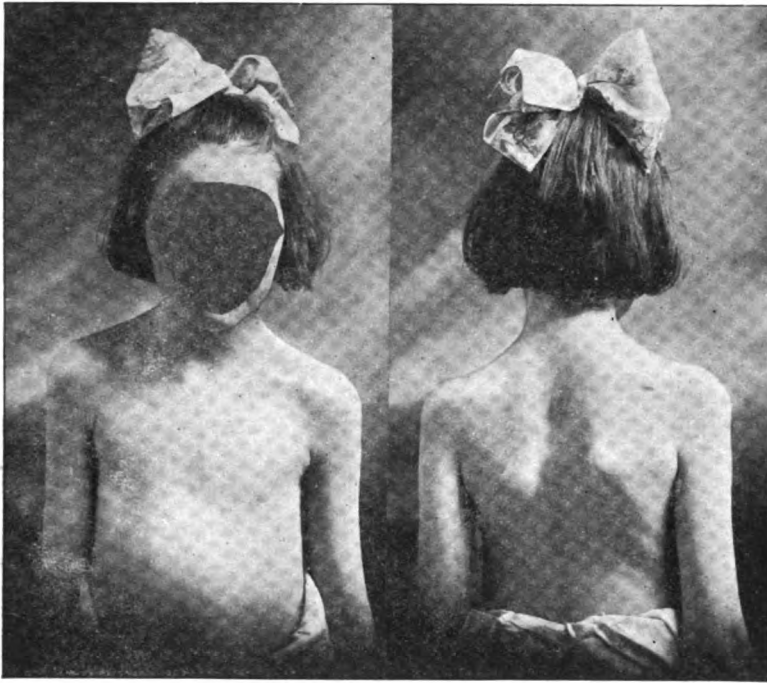
THE following case is of sufficient interest to report, not only on account of the original injury, but also on account of the effect which this has had on the vertebral column. The results as shown here are apparently due to a definite injury and not to a congenital defect, although there is no x-ray record or good photograph taken before the accident. The mother of the child is an intelligent American, and there is every reason to believe that the history is accurate.

A child of nine was seen on account of some drooping of the left shoulder, together with some lateral curvature. The mother said that at birth the child was normal, and that no difference in the height of the shoulders was observed until after the child was two years old. At this age she fell down two or three stairs, receiving an injury which at the time was diagnosed by the family doctor as fracture of the clavicle. The arm was held for several weeks in the ordinary dressing for a fracture of this kind. When the dressings were removed it was noticed that the shoulder on the side of the injury was considerably lower than that of the other side. This condition of things has always remained.

There is no evidence of an old fracture. The sterno-clavicular articulation on the right side occupies its normal position. That on the left side is situated about an inch and a half lower. The normal prominence of the sternal notch is wanting on the left side. Motion in both joints is normal.

The accompanying photographs and radiograph show the condition as it exists seven years after the original injury.

There can be little doubt that a dislocation of the sternal end of the left clavicle was produced at the time of the original injury. That such a condition exists today there is no doubt. A new joint with perfect function has been formed on the injured side.



# Orthopedic Society Meetings

## THIRD ANNUAL MEETING OF THE SOCIETY OF THE ALUMNI OF THE HOSPITAL FOR THE RELIEF OF THE RUPTURED AND CRIPPLED, NEW YORK CITY.

NEW YORK CITY, TUESDAY, DECEMBER 28, 1915.

"Transplantation of Hamstring Tendons Into the Quadriceps Extensor," by  
DR. ROYAL WHITMAN.  
Hernia Operation, by DR. WM. B. COLEY.  
Ward rounds with DR. VIRGIL P. GIBNEY and demonstration of interesting cases  
in the hospital.

### CLINICAL DEMONSTRATION OF THE FOLLOWING SUBJECTS:

- a. "Post-Operative Coxa Vara."
- b. "Method of Treatment of Lateral Curvature."  
By DR. ROYAL WHITMAN.  
"Transverse Fracture of the Fourth Lumbar Vertebra," by DR. ARTHUR C. CHILEY.  
"Results of Bone-Graft in Ununited Fracture of the Humerus," by DR. B. H. WHITEHEAD.  
"Results Obtained in Treatment of Fracture of the Clavicle," by DR. W. L. SNEED.  
"Results Obtained in the Treatment of Rotary Lateral Curvature," by DR. S. KLEINBERG.  
"The Open Method Treatment of Skin Graft," by DR. J. H. HOGUET.  
"Case of Chronic Multiple Arthritis," by DR. ARMITAGE WHITMAN.  
"Results Obtained in Hip Disease Deformities by the Abduction Method Treatment," by DR. W. E. WOLCOTT.

WEDNESDAY, DECEMBER 29, 1915.

### OPERATIONS:

"Cranial Decompression for Spastic Hemiplegia Due to a Supracortical Hemorrhage," by DR. WILLIAM SHARPE.

### FIXATION OF TENDON INTO BONE:

- "For Permanent Correction of Paralytic Foot Deformities." By DR. W. E. GALLIE.
- a. Presentation of new apparatus, instruments, etc.
  - b. Discussion of new operations.
  - c. Reports and discussion of interesting cases, etc., by the visiting members.

### CLINICAL DEMONSTRATION OF THE FOLLOWING SUBJECTS.

- "Conservative Treatment of Sarcoma of the Long Bones," by DR. WM. B. COLEY.  
"Spontaneous Dislocation of the Hip," by DR. W. R. TOWNSEND.  
"Quiet Hip Disease," by DR. HENRY LING TAYLOR.  
"Gluteal Myositis," by DR. PERCY W. ROBERTS.  
a. "New Traction Device for Fracture of the Femur."  
b. "New Apparatus for Reduction of Congenital Dislocation of the Hip."  
c. "Portable Orthopedic Table."  
By DR. GEORGE HAWLEY.  
"Dwarfism," by DR. WALTER W. STRANG.  
"Metaplastic Osteomalacia," by DR. GEORGE BARRIE.

"Joint Lesions Complicating Smallpox," by DR. WILLIAM FRIEDER.

"Some of the Difficulties in the Treatment of Fractures, as Shown by the X-ray"  
(with Lantern Slides), by DR. BYRON C. DARLING.

DR. SNEED. "Treatment of Fractured Clavicle."

Being dissatisfied with the results of the ordinary fixation, he has been using a plaster spica, including chest and arm, leaving the forearm free. The plaster is moulded snugly over the clavicle and shoulder, the arm is held in about 25 degrees abduction with shoulder well upward, backward, and outward.

He showed three cases, two of which were excellent end results without deformity, and the third still in plaster to show the method of application.

DR. WHITMAN. "A Corrective Treatment for Fixed Lateral Curvature of the Spine."

Dr. Whitman said that this treatment represented a reaction against the Abbott method, which had originally appealed to him as a rational attempt to apply surgical principles in the treatment of lateral curvature—namely, to correct deformity as a necessary preliminary to functional use. This treatment had been thoroughly tested during the past four years in the hospital. If, as Dr. Abbott had originally claimed, fixed curvature of the spine might be corrected in a few weeks with as much ease as clubfoot or bowleg, the discomforts, or even dangers of the treatment, would be of little consequence, but it had been proved that many months, or even years, were required to improve such cases materially and permanently. Leaving out of consideration the discomforts and inconveniences of the method, he would call attention to the direct mechanical consequences, which were recession and lateral compression of the chest, accompanied by a more or less resistant posterior curvature of the dorsal spine.

The treatment that he presented was suggested primarily by these inherent disadvantages of the Abbott method. It substituted lateral dorsal flexion for lateral ventral flexion, lateral flexion being made more effective by utilizing the leverage of the arm of the concave side, and fixing it in an elevated attitude to assure security.

The immediate effect was to thrust the chest forward, and to diminish, in this degree at least, the posterior projection of the ribs, to remove the pressure from the deformed vertebral bodies, to lessen the rotation in so far as this might be accomplished by correction of the lateral distortion of which it was a part. The treatment was designed to be, as it were, intensive, by changing the jackets at intervals of a week or two, on the well known principle that stretching contracted parts lessened their resistance, so that at succeeding attempts progressive correction might be accomplished.

The effects of the treatment were checked by x-ray pictures because the distortion of the trunk obtained by methods of this type was deceptive.

It was designed especially for the dorsal curves of moderate degree, and in young subjects, a class in which correction might be possible, and in which deformity, if uncorrected, usually increased during growth. The attempt was made, therefore, in the application of the jacket, to limit the correcting force to this part of the spine by preventing, as far as possible, backward and lateral bending in the lumbar region.

The only disadvantage was the fixation of the arm. Temporarily, this was an advantage, since its activity tended to increase the deformity. Its attitude was changed with succeeding jackets, and if necessary the treatment might be intermitted by the substitution of the ordinary jackets or corsets. The detail of the treatment, the manner of its application, the use of pressure pads, windows, and the like, had not been perfected, and the treatment had simply been pre-

sented to the society because its immediate effects had seemed satisfactory, as demonstrated by the x-ray pictures presented.

DR. WALCOTT showed the results in seventeen cases of correction of the adduction deformity in tuberculosis of the hip. Under an anesthetic the leg is gradually abducted, the degree depending on the amount of destruction and the relation of the trochanter.

He said that there have been no bad effects, except for a definite rise in temperature in a certain percentage of cases, which evidently did no permanent harm. There has been no evidence of the lighting up of the disease process in any case to date, and the general condition of all has been much improved.

DR. WHITMAN operated on a case of paralysis of the quadriceps, transplanting the biceps into the patella. He called particular attention to the importance of security of fixation and directness of pull. The insertion of the biceps was cut from the head of the fibula together with the underlying cartilage to furnish an unyielding material for attachment. An incision was made over the patella attachment of the quadriceps, which was split with the underlying capsule of the joint. A lateral opening was made in the capsule, and the biceps was drawn through both openings and sutured with kangaroo tendon to the quadriceps and capsule. The cartilaginous extremity was then secured to the periosteum of the patella.

This was the seventeenth case of such transplantation during his present service, and he thinks the operation is useful in increasing the stability of the limb, so that apparatus was usually unnecessary.

DR. SHARP spoke of the different types of Cerebral Splastic Paralysis in children, and divided them into three groups as regards etiology.

1. Lack of development of the cerebral cortex, for which little could be done.
2. Meningoencephalitis, following an infection, usually scarlet fever.
3. Cerebral hemorrhage occurring at birth. He said that it has always been believed that such hemorrhage caused a destruction of brain tissue, and that there could be no regeneration.

He carefully differentiates his cases, and out of 832 examined, he has found an increased intra-cranial pressure in 209, and has operated upon 195 cases with 14 deaths.

He argues for an early diagnosis, so that they can be operated upon before there was too much damage done. Five cases were operated within the third day, and normal children were obtained.

Dr. Sharp operated upon a boy 8 years old with a left spastic paralysis due to an intra-cranial hemorrhage.

DR. KLEINBERG showed several cases and reviewed the results obtained in the Abbott treatment of rigid scoliosis by means of a brace which he has used for the last two years. He believes he can control the amount of pressure by means of canvas bands better than by felt pads and jacket. The patients are more comfortable, and the changes in the back and chest can be more easily observed.

Several cases were presented showing his results. There was a distinct improvement in these cases, even if there was not a complete correction of the curve, as shown by the x-ray. He advises a careful record by means of the x-ray as being much more accurate than photographs. He says that he was not able to accomplish much in the high-dorsal, cervico-dorsal or razor-back deformities.

Summing up, it appears that while the severest types of rigid scoliosis remain unchanged, many of the moderate and mild types can be improved, and the vast majority of all types can be prevented from getting worse.

## BOSTON ORTHOPEDIC CLUB.

FEBRUARY 14, 1916.

"Experiments on the Repair of Bone," by W. E. GALLIE of Canada.

Dr. Gallie in a most interesting and convincing paper showed the results of his experimental and clinical work on bone grafting and bone repair. He used many lantern slides showing the microscopic appearances of the various stages of the life of the bone graft.

His conclusions, both from his experimental studies and his clinical work, were that the graft eventually dies, and that new bone formation takes place chiefly from the endosteum of the receptor. An interesting clinical conclusion was that in all probability a boiled, dead graft, prepared beforehand, may be just as useful as a living autogenous graft, thus simplifying the operative technic.

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## Book Reviews

*A Manual of Surgery.* By FRANCIS T. STEWART, M.D. Philadelphia: P. Blakiston's Son & Co. Fourth Edition. 1915.

As stated in the preface of the first edition, the author's aim has been to produce a manual of surgery which is both brief and practical. The recent edition fulfills both these objects, and at the same time maintains for the most part a rational perspective. The combination of these qualities suffices to make this small volume well suited to the needs of the student. The text is well written and in spite of the concentration of material is easily readable.

In addition to the excellent descriptions of the methods of general examination, there have been added under the appropriate subjects, concise paragraphs on the examination of special organs such as the bronchi, esophagus and rectum. The sections on minor surgery and the special infections are well written and cover the ground in a thorough manner without becoming confusing on account of encyclopedic discussion. Detailed emphasis is placed upon infections of the hand, the importance of which cannot be too highly estimated by students and practitioners alike. In considering fractures, the treatment as outlined hardly gives a sufficient survey to the student as to the possibilities of operative measures. It is, of course, commendable that closed reduction should be undertaken by the unskilled surgeon as being the safest and sanest method for the patient. Nevertheless, in view of the recent advances, it seems questionable as to whether the closed method should be advocated almost to the exclusion of the open method of reduction. The chapters on abdominal disease are quite as complete as is consistent with the limited space available. The operations for gastric conditions, appendicitis, and disorders of the colon and rectum are gone into with more thoroughness than obtains with other topics.

Without a doubt the individual, be he student or practitioner, who familiarizes himself with the contents of this small but comprehensive volume will find himself satisfactorily prepared to cope with most of the problems which may confront him in his daily experiences in surgery.



# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.

## I. TUBERCULOSIS OF BONES, JOINTS AND TENDONS.

LOCAL SUN BATHS IN THE TREATMENT OF SURGICAL TUBERCULOSIS. Becker. *D. Milit. Zschr.*, Jg. 43, H. 7, p. 253. Abstracted in *Zentralblatt für chir. u. mech. Orth.*, April, 1915, p. 83.

Becker reports on heliotherapy in surgical tuberculosis as carried out in Teheran, where the sun shines for seven months from a bright sky. On account of the intense heat only the affected parts were exposed to the sunlight. Among 25 cases, 15 could be observed until the cure was complete.—*C. H. Bucholz, Boston.*

ARTIFICIAL HELIOTHERAPY WITH VIGNARD'S LAMP. Martin Du Pan. *Korrespbl. f. Schweizer Aerzte*. 44 Jg., M. 43, p. 1362.

Vignard's mercury gas lamp has been used with good success on 30 children with tuberculosis of the bone, in the season that has but little sunlight. Special glass was used to avoid noxious ultra-violet rays. The general condition rapidly improved, and a marked pigmentation of the exposed parts of the body was noticed. The experiments have not yet been finished.—*C. H. Bucholz, Boston.*

LYMPHOID MARROW AND TUBERCULOSIS. AN EXPERIMENTAL STUDY. L. W. Ely. *J. A. M. A.*, November 27, 1915, p. 1868.

An experimental study of rabbits and guinea-pigs was made to see if tubercular bacilli would grow in bone marrow. In the rabbits bovine tubercle bacilli was used, and in the pigs human bacilli were used. In six of the eleven rabbits inoculated, tubercle bacilli were demonstrated. All animals killed after ten days showed marrow tuberculosis. All the six guinea pigs showed tuberculosis of the marrow. These experiments show that the lymphoid marrow of rabbit and guinea pig bone is an excellent field for the growth of tubercle bacilli.—*Edward S. Hatch, New Orleans.*

THE EARLY DIAGNOSIS OF TUBERCULOSIS OF THE VERTEBRAE. Janssen. *Münch. med. Woch.*, August 31, 1915.

The inability to diagnose tuberculosis of the vertebrae early, in adult cases, is to be admitted and deplored, since great damage is usually done before the

spondylitis is suspected. Physicians should always be on their guard to suspect Pott's disease, whenever any pain is complained of that could be referred to the spine. Pleurisy, empyema, neuralgia, sciatica, lumbago, tuberculous glands, radiating pain in the chest and abdomen, are conditions which must be differentiated. The author mentions many cases where the patients have been given long courses of treatment in massage and mechanical therapy only to have the condition develop so that anyone could have easily diagnosed Pott's disease. It may also simulate appendicitis or incarcerated hernia. Pain in the back or along the crest of the ilium, slight discomfort or weakness in the back, made worse by standing or walking, and relieved by lying down, are strongly suspicious of spondylitis. He advises conservative treatment.—*W. G. Stern, Cleveland, Ohio.*

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THE PURIFYING POWER OF HELIOTHERAPY IN TUBERCULAR SINUSES. Kisch and Grätz. *Archiv. f. klin. Chir.*, Bd. 104, H. 2, p. 494., Abstracted in *Zentralblatt für chir. u. mech. Orth.*, April, 1915, p. 87.

Under heliotherapy the cleaning of tubercular sinuses begins very soon. Frequently new sinuses are formed, but these produce only a serous secretion and serve for elimination of fungus remnants. They are usually soon closed; pain is relieved, and the amount of lime dissolved by the tissues improved. The essential of the healing of tuberculous sinuses is the substitution of the diseased tissue by a new form of scar tissue.—*C. H. Bucholz, Boston.*

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TRAUMATIC TUBERCULOSIS OF THE RIGHT ANKLE-JOINT FOLLOWING COMPOUND FRACTURE. Lonhard. *Deutsche medizin. Wochens.*, 1914, No. 32, Abstracted in *Zent. f. chir. u. mech. Orth.*, July, 1915, p. 165.

A healthy man from healthy stock received a fracture of the left external malleolus, and a compound fracture of the internal malleolus, together with a dislocation of the ankle-joint. Healing progressed favorably, but after six weeks a fistula appeared over the internal malleolus and a fluctuating swelling over the outer malleolus. By aspiration pus containing tubercle bacilli was obtained, and another aspiration eight days later also showed bacilli present. The Röntgen plate showed bone destruction and also callus formation at the site of fracture. At the end of six weeks' treatment of plaster of Paris, and iodoform-glycerine injections, healing was apparent.—*Roland Hammond, Providence, R. I.*

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A PRELIMINARY REPORT ON THE ROLLIER TREATMENT FOR SO-CALLED SURGICAL TUBERCULOSIS. J. H. Pryor. *N. Y. State Jour. of. Med.*, June, 1915.

The author urges that the constitutional treatment of surgical tuberculosis be used as in the pulmonary type, which includes fresh air, high altitude and sunshine, which should be an aid to the purely surgical treatment of these cases.

To Rollier of Switzerland is due the credit for the direct use of sunlight as a therapeutic measure in surgical tuberculosis. He starts with a five minute exposure of the extremities, gradually increasing the time and the area exposed, and when there is a good general tan, the diseased area is exposed. He also uses extension and fixation when necessary. His cases cover a period of about ten years, and claim eighty per cent. cures in the

closed cases and about seventy per cent. cures in the open cases. The altitude of Rollier's cases is about 4,200 feet above sea level.

Pryor has been carrying out the treatment near Buffalo at an altitude of about 1,650 feet and has shown that the climate is not unfavorable, cloudy weather and lack of coöperation being the two chief difficulties. Pryor reports many cures of tubercular glands and arthritis. In the drainage cases, the sinuses closed and the drainage ceased. As only a comparatively short time is included in the report only a fair idea of the value of the treatment in this country and climate can be obtained.—*Custis Lee Hall, Boston.*

TREATMENT OF SURGICAL TUBERCULOSIS. Strohmayer. *Munch. med. Woch.*, 1914, No. 39. Abstracted in *Zentralblatt für chir. u. mech. Orth.*, April, 1915, p. 86.

Strohmayer describes 120 cases treated with x-rays. The results have been very satisfactory, particularly from a functional point of view. Strohmayer thinks that the indications for conservative treatment can be enlarged so much that resections will become necessary in very rare cases only. He has never seen any damage by the x-ray. He emphasizes the importance of permanent control of the results by x-ray.—*C. H. Bucholz, Boston.*

TREATMENT OF TUBERCULOUS DISEASE OF SPINE. H. B. Thomas. *Illinois Med. Journal*, November, 1915.

Thomas believes that the Hibbs and Albee operations often shorten the time of treatment two-thirds, or in a few months give results "that it would take nature three or four years to accomplish." In his experience, the cases so operated require mechanical support for some time after operation. He uses the Bradford frame, plaster jackets and braces according to the usual indications.—*C. A. Parker, Chicago.*

THE SURGICAL TREATMENT OF POTT'S DISEASE. Roscoe Walker. *Jnl. of the Oklahoma State Medical Assn.*, September, 1915.

Walker reviews the subject of bone graft in the treatment of Pott's disease very thoroughly. He is a very hearty advocate of the Albee operation and seems inclined to the belief that braces and casts should be omitted about six weeks after the operation. He gives the technic of Albee's operation and speaks of Hibb's operation, but states that he is not familiar with it.—*C. B. Francisco, Kansas City.*

POTT'S DISEASE TREATED BY OPERATION: A REPORT OF SIX HUNDRED AND EIGHTY-TWO CASES. W. E. Wolcott. *J. A. M. A.*, January 8, 1916, p. 108.

This report is based on the replies received from sixteen surgeons, on operations done on six hundred forty-two cases. Eighty-three per cent. were benefited. Exclusive of the work of Doctors Albee and Hibbs, 73% received benefit. Twelve of the sixteen men considered postoperative support necessary. The operation should be considered as only one phase in the treatment of Pott's disease.—*Edward S. Hatch, New Orleans.*

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

REINFORCING PARALYTIC FLAIL JOINTS BY INTRA-ARTICULAR SILK STRANDS TO LIMIT MOTION AND INCREASE STABILITY. Bernard Bartow. *N. Y. State Jour. of Medicine*, September, 1915.

The author has operated upon about 150 cases during the past three years. Tunnels are drilled through the articular ends of the bones, the drill at the same time being carried into and through the joint. Through these tunnels strong paraffined silk strands are drawn. Small puncture incisions are made in the soft tissues at points where the drill enters and emerges from the bones. The best functional results have been obtained in the shoulder.—*Sidney A. Twinch, Newark, N. J.*

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THE POSSIBILITY OF RECOVERY OF MOTOR FUNCTION IN LONG-STANDING HEMIPLEGIA: A PRELIMINARY REPORT. Shepherd Ivory Franz, Mildred E. Scheetz and Anita A. Wilson. *J. A. M. A.*, December 18, 1915, p. 2150.

The cases reported and the comments thereon tend to show that possibly we may have to change our ideas of how the different parts of the brain act in production of movement. We should probably not speak of permanent paralysis but of uncared-for paralysis.—*Edward S. Hatch, New Orleans.*

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THE THUMB SIGN IN ULNAR PARALYSIS. J. Froment. *Presse Médicale*, October 21, 1915, XXII, No. 50.

Of all the motor troubles that follow a lesion of the ulnar nerve, one of the most important is any disturbance in the function of prehension (sequence of a paralysis of the adductor pollicis), the so-called "thumb sign."

The author analyzes the difference in action between grasping a heavy object firmly and grasping a light object delicately, and the part played by the thumb muscles. He also analyzes the part played by the adductor pollicis in a normal hand, and the contrast when the hand is paralyzed.

The "thumb sign" described by the author is only brought into evidence by the act of prehension and nothing indicates its existence when the thumb is at rest. In this it differs from thumb deformities heretofore described.—*W. J. La Marche, Boston.*

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TENDON FIXATION IN INFANTILE PARALYSIS. W. E. Gallie. *Annals of Surgery*, October, 1915.

Gallie gives a further report on about one hundred operations of tendon fixation using the technic previously described by him. The method is described and well shown by illustrations, also there are photographs of plaster casts made of cases before and after operation. Typical cases with their treatment are described.

A modification for the treatment of partially paralyzed muscles is described. He splits the tendon, fixing one-half to the bone, thus limiting motion in the

direction which overstretches the muscle, while the other half is left active.

After three years' experience with the method, the author recommends it very highly. He says the chief points in its favor are: (1) It prevents a recurrence of the deformity; (2) The mobility of the joint is preserved in all directions except the one in which it is desired to prevent deformity; (3) It is applicable to children as well as adults; (4) Used to assist partially paralyzed muscles; (5) It eliminates the need of silk ligament operations in practically all cases.

The question of growth of the tendon along with the growth of the bone has not been finally settled, but so far this has given no trouble.—*F. G. Hodgson, Atlanta.*

**ROENTGENOGRAPHIC BONE CHANGES IN A CASE OF POLIOMYELITIS.** G. B. Hassin, Christine Lukas and R. O. Brown. *J. A. M. A.*, October 23, 1915, p. 1459.

One case is reported and the skiagraph shown to explain the bone changes in poliomyelitis. These changes are confined to the diaphysis and the bones are thin, smooth and somewhat transparent.—*Edward S. Hatch, New Orleans.*

**APPARATUS FOR MILITARY ORTHOPEDICS.** Heymann, *Münchener medizinische Wochenschrift*, October 19, 1915, Vol. 62, No. 42.

Particular splints for radial paralysis. The author's apparatus consists of a leather cuff, 12 to 15 cm. wide, to whose extensor surface a band is fastened. This band lies on the back of the hand, reaching to about the middle of the metacarpal bones and on the palmar surface as far as the base of level of the ring finger, permitting the metacarpalphalangeal joint to be flexed. The band has the shape of a curette, it is made of steel, and exerts just enough pressure on the back of the hand to support the weight of the hand and permit the free play of the flexor muscles. When the hand is bent actively, it is brought back to the extensor position passively by means of the pulling of the muscle transmitted to the band. The pressure on the hand surface is so small that it does not disturb the closing of the fist. This splint permits a firm hold on even very small objects. The abduction of the thumb is taken care of as in the Spitzzy apparatus by means of a wire string which carries above a ring and is attached to the leather cuff. This is so smooth that a glove can be applied. This is to be nickel or gun-metal finish. The advantages of the apparatus are prevention of secondary injuries through contractures, and free play of muscles originating or inserted into the radius, and preservation of the function of the hand.—*John Dunlop, Washington, D. C.*

**LUETIC ARTHROPATHIES.** William H. Higgins. *American Jour. Med. Sciences*, November, 1915.

The author tabulates the various joint lesions found in syphilis under the following headings:

Congenital syphilitic lesions: (1) Osteochondritis syphilitica; (2) Simple synovial effusion; (3) Arthropathie deformante.

Secondary syphilitic lesions: (1) Arthralgia; (2) Acute synovitis; (3) Hydrarthrosis; (3) Bursopathy of Verneuil.

Late syphilitic lesions: (1) Bursopathy of Verneuil; (2) Tumeurs blanches

syphilitiques; (3) Acute or chronic synovitis; (4) Gummatous osteo-arthritis; (5) Charcot's joint.

Each type is described somewhat in detail and several instructive cases are quoted.—*Arthur J. Davidson, Philadelphia.*

TARDY OR LATE PARALYSIS OF THE ULNAR NERVE: A FORM OF CHRONIC PROGRESSIVE NEURITIS DEVELOPING MANY YEARS AFTER FRACTURE DISLOCATION OF THE ELBOW JOINT. J. Ramsay Hunt. *J. A. M. A.*, January 1, 1916. p. 11.

Three cases are reported in which this diagnosis could be made. The time elapsing from the accident to the onset of symptoms varied from six to thirty years. The reason of this late development is not clear. "The diagnosis rests on the presence of an old joint lesion and the neurotic character of the symptoms."—*Edward S. Hatch, New Orleans.*

LATE RESULTS OF OPERATIONS FOR CORRECTIONS OF FOOT DEFORMITIES RESULTING FROM POLIOMYELITIS. H. W. Marshall and R. B. Osgood. *Boston Med. and Surg. Journal.*, September 9, 1915, p. 375.

This article is a tabular report of twenty-six cases operated on at the orthopedic service of the Massachusetts General Hospital from 1907 until 1911. Good and bad results are considered. In conclusion of their article twenty-three cases showed distinct improvement.—*Frank R. Ober, Boston.*

A METHOD OF TESTING MUSCLE STRENGTH IN INFANTILE PARALYSIS. E. S. Martin and R. W. Lovett. *J. A. M. A.*, October 30, 1915, p. 1512.

This is a brief report of a method of testing the strength of partially paralyzed muscles in infantile paralysis by having the muscle exert its force against a spring balance. It is hoped that this method, being more accurate than the guesswork of the past, will aid in the diagnosis and treatment of the affection.—*Eben W. Fiske, Boston.*

TENDON TRANSPLANTATION FOLLOWING INFANTILE PARALYSIS. C. G. McEachern. *Colorado Medicine*, July, 1915, p. 201.

McEachern advocates the use of silk ligaments, describes the technic and recommends the insertion of the silk through holes drilled into the bones.—*Ellis Jones, Los Angeles.*

BACKACHE FROM THE STANDPOINT OF THE NEUROLOGIST. M. Neustaedter. *New York Med. Jour.*, September 18, 1915.

The most frequent cause of backache is an inflammatory condition and its attendant exudate affecting the posterior nerve roots and intervertebral ganglia, the spinal dura mater or the body of the vertebra. The spinal leptomeninges and the cord proper, *per se*, never give rise to pain.

Various bacteria may be the cause of the inflammation or it may be non-infectious or traumatic in character.—*R. B. Cofield, Cincinnati, Ohio.*

ETIOLOGY AND TREATMENT OF PROGRESSIVE PARALYSIS. A. Pilcz. *Wiener klin. Woch.*, June 10, 1915, Vol. XXVIII, No. 23.

The author discusses the etiology of general paresis, and the influence of an additional as yet unknown secondary factor besides neurotic temperament, urban life, alcohol, etc., since in the material studied only five per cent. of the syphilitics become paretic.—*F. J. Gaenslen, Milwaukee.*

HYSTERICAL JOINT NEUROSES. Carl W. Rand. *Surg., Gyn., and Obst.*, October, 1915, p. 489.

The author rehearses the many authorities who have called attention to the condition of hysterical hip in years past and quotes at length from their writings. He also gives case reports of twenty-two patients occurring in the practice of several well-known men in the medical profession.

He then gives an account of a case coming under his own observation. This woman, giving a history of previous hysterical manifestations in connection with menstruation, was brought to the hospital after a fall upon the hip. In her hearing a number of doctors made a diagnosis of a fracture, but skiagrams, clinical findings and examination under anesthesia failed to reveal any trouble. While in the hospital in bed, she manifested numerous common hysterical signs. After being shown the x-ray plates, and receiving a firm authoritative talk upon the fallacy of any organic condition present, she arose and walked forth from the hospital without difficulty, sixteen days after her fall.—*H. A. Pingree, Portland, Maine.*

DROP FOOT BOOT. A. Ritschl. *Munch. med. Woch.*, June 8, 1915.

Peroneal palsy is a frequent result of gunshot wounds. The author illustrates a cheap, but practical, pick-up brace, consisting of two strong springs fastened into the heel of the shoe, running upward on either side of the counter and ending in a padded calf strap. The springs are so bent that they pick up the drop foot when the shoe is properly put on.—*Walter G. Stern, Cleveland, Ohio.*

THE PREVENTION OF EQUINUS. J. E. Schmidt. *Munch. med. Woch.*, June 8, 1915.

This article illustrates a couple of straps arranged on the foot and calf to act as a pick-up for a drop foot. It does not look very practical, except as a "night apparatus" to be worn in bed.—*Walter G. Stern, Cleveland, Ohio.*

SOME PARALYTIC CONDITIONS RESULTING FROM SURGICAL AND OBSTETRICAL ACCIDENTS. James Warren Sever. *Boston Med. and Surg. Journal*, July 1, 1915, p. 9.

In this article Sever gives causes of Volkmann's *ischaemic paralysis*, also describes symptoms and treatment. It occurs in the flexor groups only and comes on after constriction, contusion, etc.

The irreparable damage occurs within the first three days. Musculo-spiral paralysis follows fracture of the humerus, the nerve later becoming involved in the callus or impinged on by bony spicules.

About fifty per cent. of the cases require operation and are those which do not improve or become worse.

Under *obstetrical paralysis* he discusses briefly T. T. Thomas' theory of birth shoulder injuries, with which he does not agree, basing his reasons for disagreement on previous pathological evidence. Sever says that probably the posterior subluxation occurs from excessive pull or contracted latissimus dorsi and subscapular muscles, and that the acromion grows down in front of the subluxated head. Under treatment he thinks these should be treated early, with the arm and elbow outwardly rotated, the hand supinated, the arm abducted to right angles, the whole arm being maintained in this position on a light splint. At the same time massage and exercises should be employed.—*Frank R. Ober, Boston.*

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PARALYSIS WITH WHOOPING COUGH: FOUR CASES. S. T. Soransen. *Archiv. f. Kinderheilkunde*, Vol. LXLV, Nos. 5 and 6, 1915.

In the Bleyden Hospital in Copenhagen the author saw 26 cases of whooping cough in the epidemic of 1912 and 1913, which presented complications on the side of the nervous system. All had convulsions, and of this number only five recovered. Among these were the two which had out-spoken paralyzes. The author wishes to base a favorable prognosis in paralytic cases on the above findings, but the reviewer thinks his conclusions are decidedly far fetched.—*Walter G. Stern, Cleveland.*

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A CASE OF ANTERIOR POLIOMYELITIS WITH MULTIPLE PARALYSES INCLUDING THE HITHERTO UNRECORDED INVOLVEMENT OF THE LEFT DIAPHRAGM. Philip H. Sylvester. *Boston Med. and Surg. Journal*, September 16, 1915, p. 428.

This case is chiefly interesting from a medical point of view in that it makes it more difficult to diagnose intercurrent lung conditions. The diagnosis of the condition of the diaphragm was made with the x-ray, which showed a rigid diaphragm on the left side as high as the fourth rib.—*Frank R. Ober, Boston.*

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EARLY ACQUIRED SPASTIC PARAPLEGIA ASSOCIATED WITH HYPOTHYROIDISM AND ICHTHYOSIS, WITH REPORT OF CASE. Tom Bentley Throckmorton. *Iowa State Med. Soc. Journal*, September, 1915.

A report of a spastic paraplegia case with other evidences of degenerative stigmata. The case report is very complete and shows the necessity of a complete physical examination in all cases. In this instance the accompanying anomalies of development are a hypothyroidism and ichthyosis.

The case represents little of interest from the standpoint of the paraplegia, but is of great interest in connection with the other phenomenon, and it is through the complete study of such cases that we shall arrive at more definite etiological factors. The following conclusions are self explanatory.

1. Symptoms referable to a corticospinal involvement in a true Little's disease may not appear until some time after birth.
2. The presence of stigmata such as anomalies in development, lack of thyroid function, and ichthyosis may be indicative of a degenerative condition which involves also the cells of the motor cortex or their neurons.
3. Artificial thyroid feeding should be resorted to in all cases showing a lack of proper thyroid function.
4. Consanguinity, even though remote, may be a factor in the production of an inferior type or grade of human organism.—*John Dunlop, Washington, D. C.*



POST-TYPHOID PARALYSIS. J. Zadek. *Deutsche medizin. Wochenschr.*, August 26, 1915, Vol. XLI, No. 35.

Zadek reports the case of a boy of nine convalescing from typhoid, who developed right hemiplegia with loss of reflexes. It was evidently of cerebral origin, the work of the typhoid, and it rapidly improved under electric treatment, massage and baths, and by the end of the month had retrogressed almost entirely.—*Roland Hammond, Providence, R. I.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

SUPPURATING ARTHRITIS OF THE KNEE-JOINT. Alamartine. *Revue de Chir.*, XXXIV, No. 7, p. 131.

In a young woman of 20 years, suffering from a suppurating arthritis of a knee-joint, following a pyemia, M. Alamartine simply opened the quadriceps pouch, flushed the infected joint freely with ether, and fixed the limb in a position of moderate flexion.

The rapid improvement that followed the procedure was, according to M. Alamartine, greatly—if not wholly—due to the action of the ether.—*W. J. La Marche, Cambridge, Mass.*

ARTHRITIS ASSOCIATED WITH INFECTIONS OF THE NOSE AND THROAT. James Bordley, *Southern Medical Journal*, October, 1915.

Cases are divided into three groups:

1. Arthritis deformans.
2. Chronic arthritis with acute exacerbations.
3. Acute rheumatic fever.

In group 1 were 32 cases. Of these, 8 were apparently cured (25%) by some intranasal, sinus or throat operation, 6 were benefited, 12 somewhat benefited, and 6 unimproved. The gross and minute pathology of lesions found is described.

In group 2 were 49 cases. Of these 19 were cured (40%).

In group 3—patients having had 3 or more attacks of acute rheumatism—there were 112 cases. In 79 there have been no recurrences (70% cured).

He warns against incomplete examinations and incomplete operations.—*F. G. Hodgson, Atlanta.*

THE TREATMENT OF JOINT INFECTIONS BY LAVAGE AND DIRECT MEDICATION. John W. Churchman. *Annals of Surgery*, October, 1915.

This is a very suggestive article, well written and beautifully illustrated. The work was done in the New Haven Hospital, and the Laboratory of Surgery of Yale University. Much emphasis is laid upon the bacteriological point of view, while the surgical results have not been tested out in a sufficient number of cases to make positive statements as to its value. He says the results obtained are sufficiently encouraging to justify a continuance of the study. A rather elaborate apparatus for irrigating joints and applying antiseptics is illustrated and described.

The treatment is based upon the selective bactericidal action of gentian violet. It is a very interesting article, and it is to be hoped that the method will be thoroughly tried out and the results given at an early date.—*F. G. Hodgson, Atlanta.*

**DISINFECTION OF SEPTIC JOINTS.** Frederic J. Cotton. *Boston Med. and Surg. Jour.*, Dec. 16, 1915.

From a large experience the author learned that septic joints did better when disinfected and tightly closed than when open drainage was used. The results reported in this paper apply chiefly to streptococcic, staphylococcic and gonococcic infections. His technic is as follows: Open the joint, irrigate for fifteen minutes with 1:15000 corrosive sublimate (alternately distending and emptying the cavity), then flushing out the excess with salt solution, then water-tight closure of synovial membrane and capsule and open drainage of the soft tissues, if infected. He does not often use traction in the after-treatment, as pain and muscular spasm are rarely present to demand it. Attention is called to the fact that involuntary muscular spasm is usually less marked in septic than in tuberculous joints.

In about two dozen cases he had only two poor results. What happens after such disinfection he cannot explain clearly, but rather thinks that results are due to the fact that synovial infections are only surface infections and that it is cleansing, plus natural resistance, though he does not yet dare to omit the corrosive. He has not worked out a satisfactory technic for non-distensible joints, as the hip, shoulder and ankle, in which the capsule has usually ruptured before being reached and in which tight closure is impossible. His method, therefore, applies best to the knee and elbow. Six representative cases are reported in detail.—*R. Wallace Billington, Nashville.*

**OSTEOMYELITIS OF THE LOWER JAW.** Henry Sage Dunning, Clarence A. McWilliams, and V. E. Mitchell. *Surg., Gyn. and Obstet.*, Vol XXI, No. 3, p. 306.

This paper deals mainly with necrotic osteomyelitis of the jaw from the dental point of view, and the relation of the dentist and surgeon.

This paper is divided into three parts: I. Method of infection and early treatment. II. Later treatment and prevention of deformities. III. Prosthetic appliances.—*J. A. O'Reilly, St. Louis.*

**OBLITERATION OF CAVITY IN TIBIA REMAINING AFTER SEQUESTROTOMY.** W. Gemmill, *British Medical Journal*, Sept. 18, 1915.

This brief article is a description of an osteoplastic operation recommended by Schulten. There is one small cut representing a cross section of the tibia to show the removal of bone in order that the bone flaps may be approximated.—*Wm. J. Merrill, Philadelphia.*

**DEFORMING OSTEochondritis OF THE HIP JOINT IN THE YOUNG; FIVE CASES.** G. A. Guye and H. A. Schmid. *Korrespondenz-Blatt f. Schweizer Aerzte*, Sept. 4 and 11, 1915, Vol. XLV, Nos. 36 and 37.

The authors make a detailed study of five cases of this disease, which they call Calvé-Perthes' disease. One girl of six years and four boys between the ages of four and one-half and eight years presented symptoms of hip disease. The roentgenograms of the head and neck of the femur showed a crushing down and deformity of the epiphysis, an irregularity or apparent absence of the epiphyseal line, and a broadening and curving of the neck.

It would appear that in this disease the epiphysis of the head of the femur passes through four stages of deformity: first, a flattening out; second, a splitting into two or three fragments, which are rich in lime salts; third, a splitting of these fragments into yet smaller ones which have lost their lime; and, fourth, a disappearance of the epiphysis, except that in certain cases where lime salts are administered internally some of the fragments may regain their consistence and strength.

The cause of this phenomenon is ascribed by some to an incomplete and tardy ossification, by others to some disturbance in the local circulation. It tends to spontaneous cure. Operation is not indicated. Rest in bed and weight-extension of the extremity is curative of the clinical symptoms. One of the five cases was apparently cured in one month by this method of treatment, while another required treatment for eight months. All five fully recovered without limp.—*A. Bruce Gill, Philadelphia.*

JUVENILE DEFORMING OSTEOCHONDRITIS OF THE HIP. George J. McChesney. *Jour. A. M. A.*, Nov. 6, 1915.

The author employs the title of Perthes, and defines it as a progressive destruction and crushing, principally of the upper epiphysis of the femur, characterized by a slight limp, mild subjective symptoms, a fairly constant limitation of abduction, and a benign course with complete recovery, under little or no treatment. He describes the pathology as observed by Perthes in his operated case, and as suggested by the characteristic x-ray findings. Etiology is not fully discussed. The clinical picture is briefly outlined and three cases are reported, the accompanying radiograms of which are clearly illustrative. All credit for identifying this disease is given to Perthes, whose article of 1913 is frequently referred to. No mention is made of Legg, of Boston, who was the first to describe it, in 1909.—*R. Wallace Billington, Nashville, Tenn.*

CHRONIC ARTHRITIS. Thomas McCrae. Meeting of Med. Soc. of Pennsylvania, September, 1915. Abstracted in *Jour. A. M. A.*, Oct. 9, 1915, p. 1304.

The etiologic factor in the great majority of cases of chronic arthritis is infection somewhere, and a knowledge of the cause is an important element in treatment. As the process is often progressive, it is the more essential to recognize this and endeavor to remove the cause before serious damage is done. This involves a thorough search for the possible source of infection and proper treatment if found. The effort to apply this etiologic therapy should be distinguished from measures which are merely symptomatic or those directed to improve the condition of joints already damaged.—*Arthur J. Davidson, Philadelphia.*

EXPERIENCES WITH ARTHIGON IN GONORRHEAL COMPLICATIONS. Mulzer. *D. Milit. Ztschr.*, 43 Jhrg., Nr. 13, p. 486. Abstracted in *Zentralblatt für chir. u. mech. Orth.*, April, 1915, p. 81.

Mulzer has seen good results from gonorrheal arthritis by intragluteal injections of arthigon. The intravenous injections give a too strong reaction. Mulzer avoids fixation of joints, as it may favor ankylosis.—*C. H. Bucholz, Boston.*

**NON-TUBERCULOUS HIP DISEASE SUCCESSFULLY TREATED BY DOUBLE SPLINT AND OVER-ABDUCTION.** R. Parker. *British Med. Jour.*, June 26, 1915.

The patient was a girl, aged six, who was admitted to the Liverpool Royal Infirmary on June 8, 1903. The case resembled tubercular hip trouble in many of its features, an extraordinary looseness of the joint being marked. An abscess of the joint was present, which, being aspirated and the pus examined, revealed a pure culture of staphylococci. The case is cited to show the probability that many cases of hip joint disease and Pott's disease of the spine may not be tuberculous at all, and on that account alone may be more hopefully treated. The article is illustrated and the case history given.—S. A. Twinch, Newark, N. J.

**SUBPERIOSTEAL RESECTION IN OSTEOMYELITIS. A CLINICAL AND EXPERIMENTAL STUDY.** D. P. Phemister. *J. A. M. A.*, Dec. 4, 1915, p. 1994.

These experiments were undertaken to compare the experimental and clinical resections, especially as there has been so much discussion as to whether periosteum reproduces bone or not. These experiments show that the bone grows from the periosteum. Osteomyelitis in adults is less suited for subperiosteal resection than in children. This operation should be reserved for selected cases of osteomyelitis where there is extensive bone necrosis and in inaccessible areas. Do not perform this operation when there is but one bone in the extremity, or too early, or when the infection is very severe.—Edward S. Hatch, New Orleans.

**SYMMETRICAL SYNOVITIS IN HEREDITARY SYPHILIS.** Abner Post. *Boston Med. and Surg. Jour.*, Dec. 23, 1915.

The author discusses the eleven cases reported in 1886 by Mr. Clutton, who believed the affection to be comparatively rare. In these cases the condition was described as a symmetrical effusion, free from pain, of long duration and with free mobility of the joints throughout the course of the disease.

The author calls attention to the fact that the symptoms do not always appear synchronously in the two joints, so that it is often monarticular at first. Moreover, it is a comparatively frequent manifestation of hereditary syphilis. On account of absence of pain and disability it is often overlooked. Sometimes the knees become somewhat flexed. The fluid is thick and slowly absorbed, the joint surfaces are not injured. X-rays may show changes in the tibia but none in the joint. Recovery is usually perfect, but he cites a case that had some permanent flexion. Synovitis of the knees associated with interstitial keratitis and Hutchinsonian teeth is considered as important in diagnosis as Hutchinson's triad. Mild mercurials, and in some cases, iodides and salvarsan are advised. Moderate exercise, with no local treatment, is recommended.—R. Wallace Billington, Nashville.

**TREATMENT OF GONORRHEAL ARTHRITIS.** Riebe. *D. Milt. Zschr.* 43, Jhrg. Nr. 13, p. 494. Abstracted in *Zentralblatt für chir. u. mech. Orth.*, April, 1915, p. 81.

Riebe has seen good results in cases of monarticular gonorrheal arthritis by intravenous injections of arthigon. Improvement was noticed even in old negative cases. There was a prompt relief from pain.—O. H. Bucholz, Boston.

**PNEUMOCOCCIC ARTHRITIS, WITH REPORT OF SIX CASES.** James W. Sever.  
*Boston Med. and Surg. Jour.*, Sept. 9, 1915, p. 387.

In this article Sever reports six cases of pneumococcic arthritis in children, five of which show positive bacterial findings. He classifies this type of arthritis under three forms: light, serous and purulent. The first two may get well without any treatment except fixation. In the purulent type early operation and free drainage is advised. All three types show very little permanent damage to joints.—*Frank R. Ober, Boston.*

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**SYPHILIS OF THE SPINE: ITS FREQUENCY AND THE VALUE OF ITS CHARACTERISTIC LESIONS AS A DIAGNOSTIC SIGN OF SYPHILIS.** James L. Whitney and Walter I. Baldwin. *J. A. M. A.*, Dec. 4, 1915, p. 1989.

The authors believe that spinal syphilis is much more common than is usually believed. In 100 syphilitic cases examined, 68 of the cases had some spinal lesion, and all but 4 of these were of the type characteristic of syphilis. Two types occur: the infectious and the toxic. The latter type is often taken for arthritis deformans. One of the forms of the infectious type is a synovitis without destructive change. While in this condition, a small area of the spine is made rigid, there is a hypotonicity of the ligaments and muscles of the uninvolved portions. Negative Wassermann should not be interpreted as excluding syphilis.—*Edward S. Hatch, New Orleans.*

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**CASE OF TYPHOID SPINE.** H. M. Wilcox. *Colorado Medicine*, July, 1915, p. 199.

The radiograph showed obliteration of the intervertebral disc between the second and third lumbar vertebrae, with rarefaction of the bodies. Recumbency for several weeks, followed by spinal support for four months, relieved the acute symptoms. Wilcox emphasizes as diagnostic points: (1) the clear history of typhoid fever, (2) the rise of temperature, (3) the persistent paroxysmal pain. These signs, with the radiographic findings, make the diagnosis. Local tenderness, limitation of flexion and lateral bending with obliteration of the lumbar curve are the salient points in the physical examination.—*Ellis Jones, Los Angeles.*

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#### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

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**RELATION OF URIC ACID TO GOUTY ATTACKS.** A. L. Daniels and F. H. McCrudden. *Archives of Internal Med.*, June, 1915.

An attempt to prove or disprove relationship between (1) attacks of gout and the amount of uric acid in the blood, or (2) between attacks of gout and the amount of uric acid excreted in 24 hours. Observations made upon two women with typical histories of gout and bony changes characteristic of gout. (Bruce's nodes shown by x-ray). Patients kept on an approximately constant, purin-free diet throughout investigation. The work showed that there was no more uric acid in the blood than in normal individuals. The amount of uric acid in the blood was not altered during acute attacks of gout.

Uric acid excretion was not altered during acute attacks of gout. Attacks of gout appeared during atophan administration, when, as shown by chemical analysis, the uric acid content of the blood had been greatly decreased.—*E. W. Ryerson, Chicago.*

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**CONNELLAN-KING DIPLOCOCCI INFECTIONS OF THE THROAT, WITH ESPECIAL REFERENCE TO RHEUMATISM.** J. J. King. *Med. Record*, Dec. 4, 1915.

The author has treated 78 patients, from whose throats this diplococcus was isolated, with autogenous vaccines, and only one has not been markedly improved. In many of them an arthritis, frequently multiple, was cured. He believes the joint complications are caused by absorption of toxins rather than by a bacteriemia.—*J. J. Nutt, New York.*

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**THE ROENTGENOGRAPHIC APPEARANCE IN RICKETS, WITH A COMMENT ON DIFFERENTIAL DIAGNOSIS.** Robert W. Lovett. *J. A. M. A.*, Dec. 11, 1915, p. 2062.

It was found that ten per cent. of the cases in the Boston Children's Hospital requiring roentgenographic examination were rickets. It was found that the disease could be divided into three stages. There are two types in the first stage. In the mild cases the ends of the diaphysis are not clear cut, and the epiphysis casts very little shadow. The whole joint is surrounded by a hazy cloud. In the severe type general bone atrophy occurs and the periosteum is thickened, and sometimes fractures occur.

In the second stage the shadow of the epiphysis is greater, the ends of the diaphysis begin to broaden, especially where the most strain occurs; this produces a lip next to the epiphyseal line. A clear white line is seen at the end of the diaphysis next to the epiphyseal line. In the third stage the bone ends are much clearer, the white line is more pronounced. A very important point brought out is the differential diagnosis between congenital syphilis and rickets, in that in the former the cortical thickening is periosteal and is found on the convex side of the bone, while in the latter it is endosteal and is always on the concave side of the curve.—*Edward S. Hatch, New Orleans.*

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**BACKACHE.** Harris Weinstein. *New York Med. Jour.*, Oct. 2, 1915.

The subject is considered by Weinstein from an internist's standpoint. He does not consider the local pathological changes which produce backache, but speaks more particularly of the organic diseases of neighboring or remote organs and of the metabolic disturbances which produce pain in the back, reflexly.—*R. B. Cofield, Cincinnati.*

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**VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.**

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**NEUROMA OF ULNAR NERVES; ANALYSIS OF A CASE.** Pames B. Ayer. *Boston Medical and Surgical Journal*, Oct. 14, 1915, p. 585.

The author describes a case in detail, covering a period of several years and taken from available records. A knife-cut below the elbow was followed by pain, weakness and anæsthesia referable to the nerve distribution. An

operation in six months did not remove scar tissue and gave no improvement. In four years a tumor in the scar had appeared and wasting was visible. Tumor and scar tissue were removed and nerve ends united. In two months another tumor appeared, which soon went away. In nine months most of the sensory disturbances had disappeared, but muscular wasting and disability were present.

The writer points out that the first tumor was a true neuroma and the second one a physiological end bulb. He advises even in slight injuries that a thorough surgical investigation be made with removal of scar tissue and union of nerve-ends, so that in succeeding years a permanent degeneration of nerve paths and centers may not take place.

The article is very much to the point and concisely written.—*H. A. Pingree, Portland, Maine.*

#### GIANT-CELL TUMORS OF THE TENDON SHEATHS; REPORT OF THREE CASES.

F. Beckman. *Annals of Surgery*, December, 1915.

The cases are reported in detail. These tumors are fairly common. Little in our literature regarding them, but considerable in that of the French and Germans. Commonest location is on the fingers. May be on the palm or on the perineal sheath near the external malleolus or on the dorsum of the foot. They are of slow growth, painless, encapsulated with some connection with the sheath, benign, varying from a few millimetres to several centimetres in diameter, and the name is suggested of "giant-cell sarcoid tumors of the tendon sheaths." The pathology is fully described.—*J. J. Nutt, New York.*

#### VON RECKLINGHAUSEN'S DISEASE (GENERALIZED FIBROUS OSTITIS WITH TUMORS AND CYSTS), WITH AN EXPERIMENTAL INVESTIGATION OF ITS ETIOLOGY.

F. Lotsch. *Archiv. f. klin. Chir.*, Vol. CVII, No. 1, 1915.

Lotsch's study of this disease is lengthy and exhaustive. He analyzes the cases recorded in the literature, presents cases of his own observed in the Charité Hospital of Berlin, and concludes with a report of some experimental research to discover, if possible, the etiology of the disease. He concludes that it is a systemic disease of the skeleton, the cause of which must be some noxious influence which reaches the bones directly through the blood. It is not due to direct bacterial invasion of the bones, although it may be due to an infection of some of the glands which produce an internal secretion. Direct traumatism was without effect in experiments upon rabbits.—*A. Bruce Gill, Philadelphia.*

#### CHONDROMA OF UPPER PORTION OF FIBULA. Nové-Josserand et Rendu. *Revue de Chir.*, Vol XXXIV, No. 6, p. 875.

The authors present a case of a girl in whom there was a malignant growth in the upper portion of the fibula. X-ray showed that this part of the bone was much eroded. Prognosis was doubtful. Sub-periosteal resection was performed. Authors prefer this operation to amputation because they have seen the cure of this type of tumor by conservative operation, while on the other hand, radical operation for malignant tumor does not always prevent general metastasis.—*DeForest P. Willard, Philadelphia.*

**SARCOMATOUS PROLIFERATION (SARCOMA OF RIB) IN A TRAUMATIC TUMOR SIXTEEN YEARS AFTER ITS APPEARANCE.** John H. Outland and Logan Glendening, *Journal A. M. A.*, Oct. 2, 1915, p. 1177.

One case is reported in which a sarcoma of the ninth rib developed just under two small tumors that had been in existence sixteen years, which upon operation were seen to be sarcomas of the same structure as the sarcoma of the rib.—*Edward S. Hatch, New Orleans.*

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## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

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**ANOMALIES IN THE SACROLUMBAR REGION IN THE ROENTGENOGRAM AND THEIR CLINICAL IMPORTANCE.** By Els. *Beitr. z. klin. Chir.*, XCV, No. 1, December, 1914.

Attention is called to the difficulty encountered in establishing a correct diagnosis in cases of painful back. Good x-rays and careful interpretation are prerequisites. In cases of marked lordosis, the fifth lumbar vertebra appears very much tilted, sometimes even suggesting spondylolisthesis. The radiographic shadow of the fifth lumbar approaches the outline of a horizontal section of the vertebra, while the vertical spine is found above the normal level. Normally this tilting can be made to disappear, if the lordosis is obliterated.

The abnormal formation of the spondylolisthetic vertebra is based, according to Neugebauer, on a congenital defect of the middle portions of the laminae due to absence of fusion between the two centers of ossification. Trauma in these cases may induce symptoms of obstinate character, and the congenital anomalies must be regarded as an undoubted predisposing factor.

Spina bifida occulta is found more frequently in the x-rays than spondylolisthesis. While some cases of spina bifida may of themselves give rise to symptoms, possibly from pressure of the abnormal and often distorted laminae upon the adjacent nerve structures or from connective tissue bands, they are more likely to cause trouble when associated with unusually large transverse processes or with an abnormal broadening of the corresponding vertebra-platysspondylus. In obstinate cases, surgical measures for relief will be justifiable.

The remaining portion of the paper is largely a résumé and confirmation of Goldthwait's studies of the anomalies of this region with case histories illustrating the various types of the peculiarities in question.—*F. J. Gaenslen, Milwaukee.*

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**THE PROGRESS OF CONGENITAL CLUB-FOOT AND ITS RELATION TO NON-OPERATIVE TREATMENT.** By Eben W. Fiske. *Journal A. M. A.*, July 31, 1915.

The prognosis of congenital club-foot depends upon three general factors: the condition of the foot when first seen, neglect, and the method of treatment employed. The first of these varies with the rigidity of the foot, which is usually proportionate to the age of the child. The earlier treatment is begun, the better the prognosis, advantage being taken of the plasticity of all the tissues, rapid growth of the foot in the early months, and weight bearing in the corrected position at the normal walking age. The second element



in prognosis is often unavoidable when due to parental carelessness. The third factor is, however, the one which can be directly controlled and the outlook for a good foot may, therefore, be considered the physician's responsibility, inasmuch as the results definitely vary with the selection of treatment.

There are two general methods of treatment of clubfoot; the operative, and non-operative or manipulation. The author, having been impressed by the frequent poor results following operative measures, undertook an examination of 105 cases of equino-varus and 10 of calcaneo-valgus, treated by both methods at the Children's Hospital, Boston, during a period of five years. From the tabulation of the results of these cases, presented in several charts, it is seen that the proportion of satisfactory to unsatisfactory results in the operated group is 55 per cent. and 45 per cent., while in the non-operated group 95 per cent were satisfactory. Narrowing this down to cases of the same age and degree of deformity in which the two forms of treatment were employed from the beginning, the same relation holds, warranting the conclusion that "if two patients of exactly the same age and condition were treated, one by operative and one by non-operative procedures, the prognosis of the two would greatly differ, and would be decidedly in favor of the case without operation." Moreover, over one-half of the cases with operation relapsed, most of them receiving a second operation, while relapse was seen in only three non-operated cases, all of which were referable to home neglect.

Evidently there must be some well grounded reasons for these results, beyond the fact that cases with operation are the most liable to neglect in after treatment. Strict attention to the retention of the once-corrected foot is extremely important, but the indications for retentive measures are presumably the same in both types of cases. It is evident, then, that there must be some fallacy in the correction itself of these cases with operation, and a study of conditions shows this to be so. The deformity of club-foot is entered into by all the structures of the foot, and treatment must be directed to the whole foot, and not to one or a few structures, as is the case with operation. The latter, moreover, is productive of scar tissue and ankylosis, it impairs muscle power, and consequently equilibrium and locomotion, interferes with growth and development, and often results in a rigid foot which is imperfect both from the standpoint of function and cosmetics. Gradual reshaping of all the tissues by the manipulative method, on the other hand, restores rather than impairs the physiology and anatomy of the foot, takes advantage of growth and plasticity, and avoids carelessness in after care by the very nature of the treatment. Even the element of time is favored by this method, as shown by the results of one year's treatment by the author of cases under one year of age, in which active over correction was obtained in an average of 53 days. The same method is reasonably applicable to older cases, as the elements of plasticity, growth and corrective walking may be employed during all of childhood.—*Eben W. Fiske, Boston.*

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AN OPERATION FOR CONGENITAL EQUINO-VARUS DEFORMITY: PRELIMINARY REPORT. Frank R. Ober. *Journal A. M. A.*, August 14, 1915.

This article describes the technic of an original operation for the relief of equino-varus, in which the vertical fibers of the deltoid ligament and the inferior calcaneo-scapoid ligament are cut across at the level of the sustentaculum tali, and stripped subperiosteally from the internal surface of the os calcis, allowing the inverted os calcis to rotate into an over-corrected (everted)

position. The superior calcaneo-scapoid ligament is also cut, and the plantar fascia and tendons, when they are found to prevent over-correction. The author believes the shortened vertical fibers of the deltoid ligaments to be largely responsible for the "inversion" of the foot, while "varus" is due to the contraction of the tibial tendons, outward rotation of the os calcis and anterior end of the astragalus, and to "a series of subluxations and dislocations of the mid-tarsal joint and the posterior tarsal joint," while it is maintained by the contraction of the calcaneo-scapoid ligaments.

This article does not state at what age, or with what condition of foot the operation is indicated, except that it has been used on ten children between three and 13 years of age. The results of the operation are not given, but a subsequent report is promised.—*Eben W. Fiske, Boston.*

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**BILATERAL ASYMMETRY OF THE BODY.** By Wachsner. *Berliner klin. Wochenschrift*, 1914, No. 52. Abstracted in *Zentralbl. f. chir. u. mech. Orth.*, June, 1915.

The author reported a case of an eight year old child with scoliosis who presented also these other deformities: Cervical ribs on both sides, twelfth rib on left side rudimentary, and a median cleft of the fourth dorsal vertebra. The case was evidently congenital. The right lower extremity was shorter and smaller than the left. The right thorax and breast was less developed than in the left side. The left half of the skull was less developed than the right half. This case is the youngest of its kind ever observed.—*A. Bruce Gill, Philadelphia.*

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## VIII. TRAUMATIC LESIONS. FRACTURES AND DISLOCATIONS.

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**THE BONE GRAFT WEDGE IN THE TREATMENT OF HABITUAL DISLOCATION OF THE PATELLA.** By Fred H. Albee. *Medical Record*, 1915, Vol. LXXX-VIII, pp. 257-9.

Albee offers an ingenious new method for this condition. In these cases, he says, the external condyle is often found to be on a horizontal plane much below that of the internal condyle, thus giving the appearance of rotation of the lower end of the femur, so that the external condyle is relatively farther back and the internal condyle farther forward than is normal. To overcome this he places a wedge of bone in a bed prepared for it in the external condyle in such a manner as to shove forward the anterior articular surface, thus placing the articular surface of the external condyle as an obstruction to the patella slipping outward. The bone wedge is held in place by dowel pegs of bone obtained from the tibia at the same time the wedge is obtained.—*M. S. Henderson, Rochester, Minn.*

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**BONE GRAFT. WEDGE** By F. H. Albee. *New York Medical Journal*, August 28, 1915.

Albee in his usual graphic manner presents his operation for the treatment of hip dislocations which are not properly retained by the usual bloodless methods.

After approaching the joint, he recommends a curved incision over the anterior, superior and posterior portions of the acetabulum outside the attachment of the capsular ligament, loosening a semilunar fragment of this

portion of the acetabulum. This semilunar portion is wedged outward from the main bone along its periphery while maintaining its continuity with the rest of the acetabulum throughout its deeper portion, thus deepening the acetabular cavity materially while at the same time securing an unbroken surface on the articular aspect.

To hold this position he inserts four short wedges of bone taken from the crest of the tibia into the space left by the outward displacement of the semilunar fragment of the acetabulum. These wedges are each held in place by a bone pin through a perforation in the wedge. After this, the slackened capsular ligament is gathered up with mattress sutures and the severed trochanter with its glutei muscles, previously displaced for access to the joint, fastened into place and the wound closed. A plaster cast is applied and, with modifications, left on three months, after which exercises with massage and guarded use finish the treatment.—*C. A. Parker, Chicago.*

**USEFUL SPLINT FOR COMPOUND FRACTURE OF THE LEG.** C. H. Barber *British Med. Journal*, July 10, 1915.

The article describes an ingenious fracture box which is especially suited to the treatment of compound fractures of both bones of the leg which require frequent change of dressing. It provides extension, supports the leg in a comfortable position, immobilizes the broken bones, and allows free access to the wounds without moving the limb. The article is clearly illustrated.—*Robert B. Cofield, Cincinnati.*

**FRACTURE OF THE PELVIS, WITH EXTRAPERITONEAL RUPTURE OF THE BLADDER.**

By A. E. Blackburn and W. W. Cook. *Lancet*, May 29, 1915.

The report of an interesting case of fracture of the pelvis with a wide separation of the pubic bones. Accompanied with this fracture was a bladder tear so big that the hand could readily be passed into the bladder when repair was attempted. The extravasated urine sought exit through the perineum. The condition of the patient did not allow bladder repair, so the gap was packed. The Trendelenburg splint was used for binding the pelvis together and attention was largely directed toward the care of shock, which was marked. In spite of the fact that the patient developed a mild attack of pneumonia, he recovered so that he could walk. The pubic bones are still one and a half inches apart at the synthesis. The bladder wound spontaneously healed and capacity does not seem to be materially altered.—*Edward A. Rich, Tacoma.*

**TRAUMATIC FORWARD SUBLUXATION OF THE SHOULDER: A CLINICAL ENTITY.**

By Walter M. Brickner. *American Journal of Surgery*, February, 1915.

Review of the literature and arguments for and against the possibility of there being such a condition. Cites four cases and concludes that:

Pure, uncomplicated, traumatic forward subluxation of the shoulder is a real clinical entity.

It is an occasional cause of disability that has heretofore been overlooked in the studies of stiff and painful shoulders.

Produced by mild violence.

Marked by slight prominence of humeral head in front and depression behind; slight or no flattening of deltoid. All clinical signs much less than in full dislocation.

Produces pain in shoulder radiated down arm; inability to abduct, rotation may be but little inhibited.

Doesn't show in x-ray.

In these cases reduction by abducting arm, and cured by maintaining this position 12 to 14 days.—*C. L. Lowman, Los Angeles.*

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REMARKS ON COMPOUND FRACTURE AND DISLOCATION OF THE KNEE JOINT. By Joel Crawford. *Southern Med. Jour.*, September, 1915.

The author advises amputation in all cases of open fracture of the femur extending into the knee joint, with luxation. Operation should be performed within the first 24, or at most, 48 hours. If the case is seen too late it is better to wait until the acute inflammatory symptoms have subsided.—*F. S. Hodgson, Atlanta.*

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TREATMENT OF FRACTURE OF THE FEMUR BY MEANS OF A DOUBLE ANGULAR PLASTER SPLINT: THE TECHNIC OF ITS APPLICATION AND ADVANTAGES CLAIMED FOR IT. By J. H. Downey, *Southern Med. Jour.*, June, 1915.

Dr. Downey puts up all fractures of the femur with the knee and hip both in a flexed position. He claims that the muscles are more relaxed and the fragments in the best position. He also states that there is less chance for the limb to slip in this double angular position. Also that the patient can be gotten out of bed by the fifth day or sooner and can easily sit in a chair or use a crutch with the leg held in this position. The plaster is first applied from the toes to just above the flexed knee, allowed to harden, then the fracture is reduced by traction and the plaster carried on up to the nipple line. He uses copper gauze wire to reinforce the splint. He has devised a special table for exerting traction and holding the limb at any angle while the plaster is being applied.—*F. S. Hodgson, Atlanta.*

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THE USE OF LANE PLATES IN FRACTURES: REPORT OF 48 OPERATIONS. By Fred R. Fairchild. *California State Journal of Medicine*, July, 1915.

Drawing conclusions from 48 bone plating operations during a period of four years, the author strongly champions the use of the Lane plate.

Regarding objections: First, danger of infection, and he grants that it is not a method for the surgeon who cannot operate under conditions where infections will not occur (he had one infection in 48 cases); second, as to irritation of plates, only three in 48 cases required removal.

He advises plating even of compound fractures, leaving wound open and removing plate as soon as fragments have been fixed by callus.

Regarding advantages: He says bed treatment is required for but a few days and suffering is much diminished.

He further states that the bone graft, because it gives less traumatism, lessens danger of infection (the second incision being unnecessary), and gives more perfect fixation.

He thinks the field of the bone graft will be restricted to selected cases of non-union and repair of small bones, or repair of large bones where the position can be easily held by external splints.—*Walter Baldwin, San Francisco.*

## CONTRIBUTION TO THE STUDY OF RESECTION IN INJURY OF THE HIP JOINT.

By M. Ferraton. *Revue de Chirurgie*, XXXIV, No. 7.

M. Ferraton reports the observation of a man who, falling from a horse, dislocated his right femur, anterior dislocation, the head resting under the anterior spine. The full extent of the injury was not recognized for five weeks and its exact nature even then only by a skiagram. At this time there was complete ankylosis of the hip joint with, naturally, total disability. After futile attempts at reduction, M. Ferraton proceeded on the spot to a resection that he calls "résection orthopédique atypique." Choosing an anterior incision, with chisel and mallet, the head of the femur was chipped away. The whole head and most of the neck had to be removed before he could assure a proper alignment to the limb and mobility to the hip joint. The result was an excellent one. The patient has a normal attitude, with slight prominence of the hip, and a mild compensatory spinal curve. He walks today but slightly lame, while the coxo-femoral joint is surprisingly mobile.—W. J. LaMarche, Cambridge, Mass.

## DISLOCATION OF THE OS MAGNUM; ENUCLEATION OF THE SEMILUNAR FRACTURE AND DORSAL DISLOCATION OF THE CUNEIFORM. FAILURE OF REDUCTION.

SATISFACTORY RESULT FOLLOWING THE EXTIRPATION OF THE SEMILUNAR. By M. Foisy, Case reported by M. Chaput. *Revue de Chirurgie*, XXXIV, No. 7.

The case reported by M. Chaput was that of a soldier who fell from his horse, with arm and hand flexed. The only objective symptom was a swelling over the whole carpus. A skiagram demonstrated the fracture of the styloid process of the radius, the enucleation of the semilunar, and fracture and dorsal dislocation of the cuneiform and the luxation of the os magnum. Efforts at reduction under anesthesia proving ineffective, M. Foisy decided immediately upon the extirpation of the semilunar. The result from a functional standpoint was wholly satisfactory.—W. J. LaMarche, Cambridge, Mass.

## HACKENBRUCH EXTENSION CLAMP IN COMPLICATED FRACTURES. By Füh.

*Deutsche medizin. Wochens.*, No. 50., Abstracted in *Zent. f. chir. u. mech. Orth.*, June, 1915, p. 125.

The author demonstrates an apparatus for complicated leg fractures. The clamps must not be applied over the point of fracture, but either above or below, without interfering with the possibility of producing extension. By the use of this apparatus, larger windows in the plaster for drainage could be made. This method differs from that of nail extension in that the joints can be moved and the patients walk in a few days. Ununited fractures heal quickly with this method.—Roland Hammond, Providence.

## DISLOCATION OF HIP ASSOCIATED WITH FRACTURE OF THE SAME FEMUR. BONE

GRAFTING. CASE REPORTS. By Emil S. Geist. *St. Paul Medical Jour.*, January, 1915.

Case report: Child. Multiple fractures of pelvis and shaft of right humerus. Hip reduced and fracture repaired by Albee inlay graft. Cast removed ninth week; gentle massage and passive motion of hip and knee. Four months later weight bearing allowed and more vigorous massage. Good result in femur and hip; knee motion at that time impeded fifty degrees.—C. L. Louman, Los Angeles.

**NEW FRACTURE AFTER HEALING OF BONE FRACTURED BY PROJECTILE.** By Holländer. *Berliner klin. Wochenschrift*, August 2, 1915. Abstr. in *Jour. A. M. A.*, September 18, 1915, p. 1062.

The author reports five cases in which the fractured bone and the wound had apparently healed and in which the bone was refractured at the old site or nearby through some insignificant cause. This is possibly due to a concealed infectious process, possibly to some small sequestrum, or else the effects of the primary injury to the bone persisted longer than was apparent.—*A. Bruce Gill, Philadelphia.*

**ON THE SERBO-CROATIAN METHOD OF REDUCING FEMUR AND LEG FRACTURES.** By Albert Jentzer. *Revue Médicale de la Suisse Romande*, August 20, 1915.

The author describes the now well known method of Florschütz, chief surgeon to the hospital of Essek on the Drave river, in the treatment of leg and thigh fractures. This method was practiced during the Serbo-Turkish war of 1918. A long pole extends over the patient, recumbent in bed, from the head of the bed to its foot. This pole is supported at the lower end of the bed by a plank extending a few feet into the air, and is higher here than at the head of the bed. The fractured leg after reduction is suspended semiflexed in the air by means of broad bandages to the long pole lying above it, one bandage generally going under the ankle, one under the calf and one under the thigh. Traction is added if indicated and is after the method of Bardenhauer. The method has the advantage of simplicity. Bed sores need not be feared, and the immobilization not being complete there is less danger of stiff joints. In case of compound fracture, there is a good opportunity to dress the wounds. This method has already been described in the *Lancet*.—*J. Appleton Nutter, Montreal.*

**FRACTURES.** By J. F. X. Jones. *New York Med. Jour.*, August 28, 1915.

Jones concludes that "the best plan to adopt regarding the treatment of fractures is that followed by Robert Jones, John Chalmers Da Costa and several other surgeons of broad experience and sound judgement." These gentlemen operate primarily for:

- Fractures of the patella;
- Fractures of both bones in the leg in the lower third;
- Most fractures of the os calcis;
- Some cases of Pott's fracture;
- Most cases of fracture of the upper third of the femur;
- Some fractures of the neck of the femur in the young and middle aged;
- Some fractures of the surgical neck of the humerus;
- Fractures of the olecranon, especially those in which the fragment was rotated;
- Some fractures of the elbow joint;
- Some fractures of both bones of the forearm (in order to preserve pronation and supination);
- Some fractures of the metacarpus;
- Fractures of the zygoma;
- Some fractures of the mandible;

Fractures of the clavicle, when complete reduction is impossible, or when sharp pointed fragments threaten to pierce the skin or damage important structures;

In compound fractures, in many comminuted fractures, if an important nerve or blood vessel has been divided.

Most children are manageable by conservative methods, and do not do as well as adults after operation.

If an operation is decided upon, the patient should be told in advance that he may not get a good functional result, because too frequently the history of the postoperative career of one whose simple fracture has been cut down upon justifies the criticism that "the last state of that man is worse than the first."

Unless he is convinced that without operation, function will be bad, and unless he is in a position to avail himself of scrupulously aseptic technic, the surgeon who employs the open method of treating a simple fracture, is subjecting his patient to an unjustifiable risk. Osteomyelitis, necrosis, multiple operations, amputations, death—these have been some of the results of infecting a simple fracture.

If it is true that in the past ten or fifteen years brilliant results have been achieved by a few operators on simple fractures, while many have failed with the non-operative measures at hand, shall we jump to the conclusion that therefore all simple fractures should be operated upon? Or shall we be candid enough to infer that many of us have neglected our opportunities to perfect our non-operative technic?"—C. A. Parker, Chicago.

CONSERVATIVE TREATMENT OF FRACTURES, By R. W. Knox, *Southern Medical Journal*, June, 1915.

Emphasis is laid upon proper reduction of fractures. Nine out of ten cases that "slip out" have not been properly reduced. If an open operation is necessary it is sometimes found that when the fracture is accurately reduced, no internal fixation is necessary.

The femur is an exception, very often tending to slip even after perfect reduction. Here a long steel plate is advised with a long double plaster spica to maintain reduction and avoid bending of plate. The author, contrary to the usual teaching, advises the use of a long bone plate in *infected* fractures to maintain proper alignment. After the infection has cleared up, the plate is removed.

A walking brace of plaster and steel is advised for non-union in the lower extremities.—F. G. Hodgson, Atlanta.

A CASE OF FRACTURE-DISLOCATION OF THE SPINE: LAMINECTOMY. By R. E. Ledbetter and H. Priest. *United States Naval Med. Bulletin*, July, 1915.

In this article there is a description of an immediate operation following injury to an ordinary seaman who was struck by a swinging bag of coal. The spine was shattered through three vertebrae and the cord macerated. All the loose pieces of spine and cord were removed. The man was living eight days after the operation but the paralysis persisted. The case is of interest only in exposing the extent of the lesion and demonstrating the value of a clean technic.—John Dunlop, Washington, D. C.

**MECHANICAL TREATMENT OF COMPOUND AND SEPTIC FRACTURES.** By Robert McQueen. *Lancet*, August 7, 1915.

An article describing some cheap and ingenious splints for the common fractures seen in war service. The splints are made of bar aluminum after the suggestion of Mr. Robert Jones.—*Edward A. Rich, Tacoma.*

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**TREATMENT OF SEPTIC COMPOUND FRACTURES AND WOUNDS BY IONIZATION OF SALICYLATE OF SODIUM.** By Robert McQueen, and Leslie H. Boothby, *The Lancet*, July 10, 1915.

Wounds of the present European war, especially those produced by shrapnel, are of a terribly septic nature. Captain McQueen and his associate, Boothby, experimented with various agents to combat this septicaemia. Powders were first used and abandoned. Ionization with salicylic acid was followed by ionization with the sodium salt, the salicylate. Other solutions have been tried but the salicylate of soda proved superior in many respects. With it, suppuration diminished most rapidly, the tissues around the wound would look healthy and the patients were granted the minimum of pain.

The wounds are not treated with any other antiseptic. Four per cent. solutions are employed for cleansing. The pockets that open up from the main wound are packed with gauze soaked in an 8% solution, warmed. Over all a pad soaked in the stronger solution is placed and attached to the positive pole of a galvanic battery. A current of five to 30 milliamperes is allowed to pass for at least a quarter of an hour.—*Edward A. Rich, Tacoma.*

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**TRANSPORT OF CASES OF FRACTURED THIGH.** By C. M. Page. *British Medical Journal*, July 31, 1915.

This article details the features of a modified Thomas' knee splint which fulfills the ideal requirements of fixing the thigh fractures for transportation from the field ambulance to the base hospitals,—*Robert B. Cofield, Cincinnati.*

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**THE ROENTGEN RAY A DIAGNOSTIC FACTOR IN MYOSITIS OSSIFICANS CIRCUMSCRIPTA.** By Charles A. Pfender. *Washington Medical Annals*, May, 1915.

Dr. Pfender, in reporting a case, takes occasion to review the literature of myositis ossificans. The article is rather an exhaustive study.

There seem to be two types, the myositis ossificans progressiva, which is as its name signifies, progressive and general; and the myositis ossificans circumscripta, which is localized, the latter term having been proposed by Küttner. The etiology of the latter is divided into three groups:

1. Traumatic.
2. Non-traumatic.
3. Neurotic.

The traumatic group may be divided, according to Küttner, into (a) single severe traumatism, or (b) a chronic or occupational traumatism. The symptoms in the traumatic type are local pain following a contusion together with swelling and increased tenseness or induration due to the development of a hematoma. This inflammatory stage gradually subsides and is followed by a period of improvement. The next subjective sign that arises is the patient's



consciousness of weakness of the involved part. It is during this stage that the development of muscle bone is going on, and the latter is directly proportional to the lack of absorption of the hematoma. The pain at this point seems to be in proportion to the pressure symptoms. This bony myositis may develop within a week, *post-traumaticum*, although the induration is usually longer. "The majority of these growths are probably connected with the skeletal bone, but a not inconsiderable number occur where bone is not contiguous and where the muscle tumor is not even remotely associated with normal bone structure."

A number of cases were not diagnosed by clinical means for the simple and sufficient reason that this condition received no consideration whatever.

The Roentgen ray is the most valuable aid in diagnosis. "In the first few weeks of the transformation the shadow will be light and filmy in appearance, very much like recent callous, not homogenous, but presenting lighter and darker areas. When the condition is more advanced, ossification of the growth is manifested by a denser shadow and the lighter and darker areas assume a more or less linear arrangement, the general direction corresponding to the muscle fibres. After complete ossification has been obtained, the process remains stationary for a while, permanently so, in some instances. From the study of the material compiled, Küttner formulates the following conclusions as to the course and prognosis: The growth may obtain its maximum in a relatively short time and then undergo spontaneous regression after a few months. Connection with the skeletal bone makes the prognosis more favorable; the greater the muscle injury, the slower the recovery. The tendency to spontaneous recovery, however, is quite pronounced." The description and prognosis would indicate that the treatment should be conservative. The case reported by Dr. Pfender showed regeneration shortly after a settlement had been effected with the railroad company by which the patient had been injured. The case is instructive in that it shows the possibility of spontaneous absorption which should be taken into consideration in any legal procedure.—*John Dunlop, Washington.*

**EXTENSION DEVICE FOR TREATMENT OF FRACTURE OF LEG.** By Ritschl. *Münch. med. Woch.*, LXII, No. 19, May 11, 1915.

To construct the hammock a flexible wire or aluminum rod is first bent to conform to the outlines of the posterior surface of the uninjured leg and sole of the foot. This is sewed to a length of cotton flannel, the free edges of which are turned and sewed back to form loops through which on either side are run wires. These are attached by three stout tapes to a bar of wood which in turn is suspended by the ends to a support above the bed. This gives a support fitting the leg and holding the foot in dorsal flexion.

Extension is applied by two bow-shaped pieces of hazel wood or willow, joined together at the ends. At each end is a spreader, to which are attached the adhesive straps leading from the upper and lower bone fragments respectively. The upper spreader is attached to the upper bow ends by a cord, the lower by a cord with firm knots every centimeter or two. Extension is varied by these knots which fit into a groove in the lower bow-ends. The sides of the bows are supported by cords running to the wooden bar.

This arrangement permits free access to the leg, gives the advantages of the elevated position and permits mobility of hip, knee and ankle.—*Freeman Bosworth, Boston.*

**TEMPORO-MAXILLARY DISLOCATION OF LONG STANDING: REDUCTION BY THE "ENGLISH KEY."** By Roux of Lausanne. *Revue Médicale de la Suisse Romande*, June 20, 1915.

The author describes his successful treatment of a case of double temporo-maxillary dislocation of two months' standing in a woman about 38. Two manual attempts under ether failed. Recourse was then had to the "English Key" (which means the Thomas wrench), and the reduction was easily accomplished. The handle of the wrench is vertical when applied, its rubber-covered arms embracing the mandible between them. The bone is forced backward and downward and so reduction is accomplished with ease. No damage was done to teeth or gums.

The method seems a very good and practical one for cases of long standing.  
—J. Appleton Nutter, Montreal.

**"TRENCH BACK" TREATED BY SODIUM SALICYLATE IONIZATION.** By J. D. Sandes. *British Medical Journal*, August 7, 1915.

"Trench back" is a term applied to a variety of conditions arising from injury in the lumbar or sacral regions and is usually caused by the impact of heavy objects, such as a quantity of earth or sandbags, striking the individual. The frequency of this condition in the present methods of warfare and the prolonged disability which it usually entails caused Sandes to bring forward the following method of treatment: All cases before being treated in the manner suggested should be examined by the x-ray, and those which have sustained injury to the spine or pelvis excluded. Patients with anesthesia of the lumbar and sacral regions are not suitable for ionization as they are very liable to be badly blistered during the treatment. The symptoms are usually due to contusion or sprain of the muscles or fascia alone.

Ionization is applied as follows: A one per cent solution of sodium salicylate is used to saturate a large pad sufficient to reach across the back, and eight or 10 inches broad, composed of at least six layers of lint. The patient is placed face downward and the pad is laid over the painful area. A mail chain electrode is placed on top of the pad and the whole firmly bound with a bandage. The mail chain electrode is connected with the negative pole of a battery or electric machine. The indifferent pole, moistened with sodium chlorid solution, is placed on some other region, say the upper dorsal, and the current is gradually turned on, the treatment lasting for about 15 minutes. Applications are repeated twice weekly, a cure resulting in some cases in two or three applications.—Robert B. Cofield, Cincinnati.

**MYOSITIS OSSIFICANS TRAUMATICA.** By Oscar M. Shere. *Journal A. M. A.*, September 18, 1915, p. 1012.

Myositis ossificans traumatica occurs only in closed wounds. The wounds should be made into open ones and the new bone removed. Drainage should be kept up until the tissues feel normal to the touch. These cases closely simulate sarcoma.—Edward S. Hatch, New Orleans.

**SEVERE CRUSHING INJURY TO THE KNEE JOINT.** By W. F. Smith. *Southern Med. Jour.*, June, 1915.

The subject is considered as follows:

1. What is traumatic shock?
2. Why does shock follow crushing injuries to the knee?
3. How may we combat the effects of this shock?

Under the last heading he advises morphine, transfusion of blood, the use of anoci association in operating.—*F. G. Hodgson, Atlanta.*

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TREATMENT OF UNUNITED FRACTURES. By Hugh H. Trout. *Southern Medical Journal*, June, 1915.

This is an excellent article and gives us a very strong argument in favor of autogenous bone graft over any other method of treating ununited fractures. Author did a series of experiments, using Belgian hares. He made infected wounds in the rabbits' legs and then placed vanadium screws through the infected area into the bone. In 24 cases, 22 screws worked out and were removed; two cases healed in. He then took autogenous bone grafts from the sound leg of a series of rabbits and placed then through an infected area into the bone. In a total of 44 grafts, five worked out, while 39 healed in place and were found by x-ray or autopsy. "These two series demonstrated experimentally: first, a foreign body is far more apt to give trouble in the presence of infection than an autogenous graft; and second, an autogenous graft will 'take' in a proportion of cases in the presence of various types of acute and chronic infections."

Another series of experiments was done. Vanadium screws were placed in the epiphyseal line of the long bones of rabbits under aseptic precautions. Then autogenous spicules of bone were placed in the epiphyseal line of the tibia in another series of rabbits. With the steel screws 40% of the cases showed shortening in the long diameter, while with the autogenous pegs, there was no shortening in any case.—*F. G. Hodgson, Atlanta.*

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REPORT AND CLINICAL DEMONSTRATION OF A CASE OF FRACTURE OF TWELFTH DORSAL AND FIRST LUMBAR VERTEBRÆ: LAMINECTOMY AND RESULT. By W. T. Willien. *Lancet-Clinic*, August 21, 1915, p. 167.

Willien reports a case of fracture of twelfth dorsal and first lumbar vertebrae, causing compression of cord with complete paraplegia, in which a laminectomy was performed eighteen days after injury. All fractured portions of vertebrae were removed and patient recovered with good functional result.—*Robert A. Maddox, Cincinnati.*

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IX. MISCELLANEOUS DISEASES. GENERAL ORTHOPEDIC ARTICLES. PHYSICAL THERAPY, APPARATUS, ETC.

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ORTHOPEDIC SURGERY AND THE CRIPPLE. By Nathaniel Allison. *Journal A. M. A.*, August 28, 1915.

The orthopedic surgeon is apparently more interested in the potential cripple, that is, in the type of cripple whose deformities may be prevented or alleviated by proper surgical procedures, than in the actual or permanent cripple, who has no outlook for improvement. The number of the latter, especially of those outside the 37 institutions in this country devoted to the care of cripples, is surprisingly large, it having been variously estimated

that there are from 50,000 to 250,000 cripples in the United States, while but 2,000 of these are at present in institutions, the latter being almost wholly in the larger centers. It would seem obligatory that every orthopedic surgeon should educate his community to realize that crippled children require a special education, which should be vocational and properly suited to the cripple, and that it is the duty of the state to carry out this work, in the direction of which the orthopedic surgeon should be of great assistance.—*Eben W. Fiske, Boston.*

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SPLINTS FOR EXTENSION OR FOR MOBILIZATION OF STIFF JOINTS. By H. Backhammer, F. Schede and L. Horn. *Münch. med. Woch.*, May 25, 1915, LXII, No. 21.  
Nothing new.—*Freeman Bosworth, Boston.*

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FURTHER OBSERVATIONS ON THE FATE OF FREE BONE TRANSPLANTS. By W. L. Brown and C. P. Brown. *Journal A. M. A.*, September 18, 1915, p. 1007.  
Eight experiments are reported; all free transplants either with or without periosteum, were absorbed. This occurred without regard to the size of the transplant.—*Edward S. Hatch, New Orleans.*

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SKELETAL REMAINS OF PRIMITIVE MAN. By N. W. Ingalls. *Cleveland Medical Journal*, May, 1915.

A resumé of well known anthropological data on the earliest known crania: Neanderthal skull, Mauer jaw, Gibraltar skull, Cro-Magnon skull, etc.—*C. L. Lowman, Los Angeles.*

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USE OF AUTOGENOUS RIB GRAFT IN RECONSTRUCTIVE SKULL SURGERY. By Roscoe H. Kahle. *Journal A. M. A.*, July 17, 1915, p. 222.

A very interesting case is reported in which a piece of rib was used to close a skull opening due to injury and necrosis. The result is good.—*Edward S. Hatch, New Orleans.*

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MECHANOTHERAPY FOR THE WOUNDED. By Kirchberg. *Therapie der Gegenwart*, April, 1915, LV, 1, No. 4.

This paper deals with medico-mechanical and physical therapeutic agents in the treatment of the wounded. In the preliminary surgical work, emphasis is laid on the necessity for primary consideration of functional rather than cosmetic results. The author urges avoidance of too prolonged fixation of extremities because of resulting atrophy of muscles and stiffening of joints. Isolated voluntary muscle contractions during the period of fixation, especially of the quadriceps in wounds of the lower extremity, are urged to prevent or minimize atrophy of this muscle. In many instances osteo-arthritic changes, so prone to develop in the opposite knee, should be guarded against. The author describes how, with very limited means, he has sought to do justice, in hospital and dispensary, to the great numbers of wounded requiring attention along medico-mechanical lines. Among the measures used were mechanotherapy, including massage, gymnastics and apparatus work, also suction, electrotherapy, thermotherapy and diathermy.

Contusions and distortions of joints especially require early treatment designed to hasten resorption and prevent secondary changes. Twenty-four hour rest after injury is indicated for the formation of firm thrombi in the larger vessels. After this, massage is indicated, followed by active motion. In the shoulder joint early treatment is especially desirable.

The author states that in many instances complete freedom of motion is possible within three weeks after severe contusions and even dislocations. He believes that extensors atrophy more rapidly than flexors, because the former usually traverse only a single joint while the latter traverse two joints. Immobilization, therefore, abolishes activity less completely in the case of the flexors.

Joint contractures are treated with heat, followed by massage, gymnastics and apparatus work. Adjustable appliances are described for use on special joints. These are worn for many hours daily and frequently adjusted, as the contractures gradually give way. The relief of nerve compression, due to scars, is often readily accomplished by hot sand baths, followed by the use of suction apparatus, the latter best adapted to allow alternate suction and compression. Suction treatment of old fistulae has yielded good results.—*F. J. Gaenslen, Milwaukee.*

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NEW POSITION IN RADIOGRAPHING SHOULDER JOINT. By W. S. Lawrence. *American Journal of Roentgenology*, April, 1915.

Arm raised from body to nearly right angle, tube placed below axilla and plate held above shoulder by assistant, who also grasps patient so if one moves the other does; patient grasps tube stand with the extended arm.

This view taken in conjunction with regular posterior view gives views at right angles and assists in locating given points as in fractures, etc.—*C. L. Lowman, Los Angeles.*

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PROVISION FOR WAR CRIPPLES IN GERMANY. By Douglas C. McMurtrie. *Med. Record*, 1915, LXXXVIII, pp. 184-7.

This paper emphasizes the extraordinary preparedness of the German Empire for this war. The scope of the work falls within two categories; (a) medical care, and (b) social care. The orthopedic specialists have largely been recalled from the front to resume their duties at their civil posts. Adults have been crowded into these institutions and in many cases the children put out with private families. It has been impressed upon the public and the patients themselves that cripples are not condemned to idleness but can be made useful members of society. The suggestion is made that the State will, when placing orders with civil concerns, impose the condition that a proportion of the laborers employed be war cripples. No segregation of cripples should be allowed. Fifty-four German institutions for cripples comprise 221 shops for industrial training, in which 51 occupations are now being taught. The work is slow and final results will not be forthcoming for a considerable time, but the manner in which the problem is being met is unquestionably sound.—*M. S. Henderson, Rochester, Minn.*

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IMPORTANT SOURCE OF ERROR IN THE HEART EXAMINATION OF SOLDIERS. By B. Molnar. *Wiener klin. Woch.*, May 27, 1915, XXVIII, No. 21.

The author calls attention to the fact that in the very erect position of soldiers during "attention" both relative and absolute cardiac dullness is smaller than in the vertical position at ease.

This is due to the enlargement of the thorax during "attention" and the crowding of the edge of the lung between the heart and chest wall.

He believes the examinations with the patient standing at ease are more accurate.—*F. J. Gaenslen, Milwaukee.*

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**HISTOPATHOLOGY OF CALCIFICATION OF THE SPINATUS TENDONS AS ASSOCIATED WITH SUBACROMIAL BURSTITIS.** By Eli Moschowitz. *American Journal Med. Sciences*, July, 1915.

This contribution is based upon the histological study of portions of diseased tendons in four of Brickner's cases, reported under the title, "Prevalent Fallacies Concerning Subacromial Bursitis; its Pathogenesis and Rational Treatment" (*American Journal of Med. Sciences*, March, 1915,) in which article Brickner described his observations, surgical and radiographic, of calcaneous deposits in and upon the supra- and infraspinatus tendons, associated with adhesive subacromial bursitis.

Moschowitz admits that the early and common incidence, appearance of lime in these cases, has no precise counterpart and neither he nor Brickner is able to submit a satisfactory explanation.—*Arthur J. Davidson, Philadelphia.*

---

**CARE OF THE ABDOMEN IN INFANCY AND CHILDHOOD.** By Eliza M. Mosher. *New York State Journal of Medicine*, December, 1915.

Infants should be kept chiefly in the horizontal position to avoid overstretching the abdominal muscles and the mesenteric folds.

In the typical "pot-bellied" baby the abdominal wall is thin, the intestines sag and are usually more or less dilated and a condition of stasis results. Intestinal toxins may be responsible for the cephalic changes which are usually associated. Epileptic cases have been recorded in which abnormal conditions within the abdomen were present that must have begun in infancy and may have been congenital. To prevent enteroptosis in infants and children certain measures are important: proper feeding with special reference to the time and quantity, a longer continuance of the horizontal posture of the trunk than is common, a life in the open air, prevention of mental forcing, and development of the abdominal muscles.

Overdistention of the stomach and intestines is common in bottle-fed babies and is due both to overfeeding and the flatulence which accompanies indigestion.

Infants under six months should always be horizontal. Later, when the abdominal muscles are strong enough to permit the sitting posture, some modification of the "go-cart" is better than the present baby carriage. All clothing should be loosely fastened and should not interfere with the freedom of motion of the baby's limbs. A few minutes spent daily in exercises to strengthen the abdominal muscles of the growing child are of great value.

Pure air and correct posture in school are very important factors in normal development. Correct posture is being taught in the New York schools as well as the use of properly fitting garments.—*Walter G. Elmer, Philadelphia.*

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**ADJUSTABLE CRUTCH.** By A. Pinard. *Bulletin Académie de Médecine*, August 17, 1915.

The author presents an adjustable crutch which, he considers, includes many useful features that have not yet been found in any one patent. The

crutch is made with two ordinary uprights and padded axillary support. At the bottom the uprights are connected with a wooden block into which is screwed a single upright. By means of the screw, the single upright can be lengthened and shortened for a distance of 14 cm. The hand bar is also adjustable.—*DeForest P. Willard, Philadelphia.*

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TREATMENT OF BURNS OF THE EXTREMITIES WITH SPECIAL REFERENCE TO THE PREVENTION OF DEFORMITIES AND PRESERVATION OF FUNCTION. By Charles A. Parker. *Journal A. M. A.*, July 3, 1915, p. 16.

After the slough comes off in third stage burns, successive strips of adhesive plaster are used to cover the burned area. These are changed twice a week. Plaster-of-Paris split splints are now used to keep the parts in good position for months while healing goes on. By this method contractions are obviated.—*Edward S. Hatch, New Orleans.*

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IMPROVED TECHNIC FOR EXARTICULATION OF THE FEMUR. By Riedel. *Archiv. f. klin. Chir.*, October, 1914, CV, No. 4, p. 826.

Reidel recommends ligation of the femoral artery as the first step in exarticulation of the hip, on the ground that during quiet respiration the negative pressure in the veins is sufficient to cause complete depletion not only of the veins but of the arteries as well.

While most of the blood in the extremity will be saved by the use of an elastic compression bandage carried from the toes upward, that in the bones as well as that in the soft tissues above the bandage can also be saved by the procedure indicated. The author uses the technic as originally described by him in 1902.

The femoral artery is doubly ligated and severed just above the origin of the profunda. The femoral vein, on the other hand, is preserved until just before the exarticulation of the head. The circular incision of the capsule close to the rim of the acetabulum and of the ligamentum teres is almost bloodless. During stertorous breathing the vein will be engorged with blood. It is essential, therefore, when dividing the vein that the breathing be deep and quiet, in which case the femoral vein will be perfectly flat and bloodless. Scarcely a dram of blood will flow from the divided distal end upon removal of the ligation.—*F. J. Gaenslen, Milwaukee.*

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AN APPARATUS FOR SUSPENDING WOUNDED ARMS IN FIELD SURGERY. By Schultes. *Deutsche medizin. Wochens.*, 1914, No. 45. Abstracted in *Zent. f. chir. u. mech. Orth.*, June, 1915, p. 128.

A curved wooden support 2.25 m. long, 2.5 cm. wide and 1 cm. thick is fastened over the bed by attaching it to the iron cross bars at the head and foot of the bed. To this the injured arm is easily fastened.—*Roland Hammond, Providence.*

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CONTINUOUS EXTENSION IN TREATMENT OF SCIATICA. By I. Svindt. *Ugeskrift for Læger*, April 22, 1915, LXXVII, No. 16, pp. 597-636.

Svindt has employed the extension treatment of sciatica in 26 cases. Early relief of pain and permanent cure in most cases are claimed for this simple.

easily applied method. The average duration of extension was three weeks, followed by massage and hydrotherapy for ten days.

Only two patients reported recurrences, but were relieved by same method.

He begins with a weight of six or eight pounds which is gradually increased to fourteen or sixteen pounds when pain usually subsides. Sedatives and salicylates are used sparingly as adjuncts to treatment in the early acute stage.—*Ellis W. Jones, Los Angeles.*

THE ORTHOPEDIC ASPECTS OF CHRONIC INTESTINAL STASIS. By Loring T. Swaim. *Pennsylvania Med. Journal*, June, 1915.

The orthopedic treatment of intestinal stasis is directed towards producing normal physiology and functioning in the visceral organs through correction of posture and relief of muscular and bony strain.

Accomplish this, and not only does the stasis improve, but the whole bodily mechanism is working with greater efficiency and less friction. The correction of posture so changes the shape of the body that the normal relation of parts is secured.—*Arthur J. Davidson, Philadelphia.*

RECENT EXPERIENCES IN SPINAL SURGERY. By R. Tunstall Taylor. *Southern Medical Journal*, June, 1915.

Two very interesting cases were presented, one of spinal fracture-dislocation which was operated upon with relief of symptoms, the other a case where the transverse process of the fifth lumbar vertebra was removed giving great relief to a young woman who had suffered for nine years.

Mention is also made of the Albee and Hibbs operations as recent advancement in the treatment of spinal tuberculosis.—*F. G. Hodgson, Atlanta.*

ORTHOPEDIC SURGERY. By A. H. Tubby. *Practitioner*, July, 1915.

This is a review of previous papers by various writers. There is nothing new.—*C. Stewart Wright, Toronto.*

PHYSICO-MECHANICAL AFTER-TREATMENT. By F. Wachter. *Wiener klin. Woch.*, May 13, 1915, XXVIII, No. 19.

The author calls attention to the necessity for more extensive application of orthopedic measures in the treatment of the wounded.

The cases treated at the Orthopedic Institute of the Surgical Clinic at Innsbruck included contractures of various types, painful scars, muscular atrophies and ankylosis. The usual medico-mechanical measures, heat in various forms, massage and exercises are employed. Diathermy is especially indicated in rheumatic affections, while bone and joint injuries are best treated with hot air.—*F. J. Gaenslen, Milwaukee.*

OPERATIONS ON TENDONS AFTER WOUNDS OF THE HANDS. By K. Wagner. *Wiener klin. Woch.*, May 6, 1915, XXVIII, No. 18.

The author calls attention to the frequent occurrence of tendon defects of the extensors of the hands, resulting from gun shot wounds, while the flex-



ors remain intact. Early secondary suture prevents severe secondary contracture of the flexors, and restores the wounded to military service in a short time. The author has repeatedly restored the continuity of the tendon by dissecting out a bridge of scar tissue uniting the severed tendon ends. If the connecting bridge is too long, a portion from the distal segment is excised.

Prevention of adhesions is accomplished by slipping the tendon through calves' arteries preserved in Ringer solution, or through fresh calves' arteries soaked for 30 minutes in 3% hyperol solution. In one case the author used with success a fresh rabbit's trachea prepared in similar manner. These materials are not absorbed until the danger of adhesions is over. According to the author's experience, these measures, however, are not necessary, provided early immediate function is insisted upon. Splints are used only rarely, and if so, only for short periods and removed daily for moderate active and passive exercises. Suture in hyper-extension of fingers is not necessary or advisable, because of danger of tearing, due to excessive strain, while the impossibility of carrying out early exercises predisposes to adhesions.—*F. J. Gaenslen, Milwaukee.*

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**PSEUDOARTHRISIS CAPABLE OF FUNCTION IN SEVERE JOINT INJURIES.** By Weissbrem. *Deutsche medizin. Wochensh.*, 1914, No. 40. Abstracted in *Zent. f. chir. u. mech. Orth.*, June, 1915, p. 136.

From an accident in childhood the articulation of the right elbow was seriously disturbed in one case. A new joint between the radius and humerus, and one between the radius and ulna had formed, accompanied by great mobility of the joint. The patient is 67 years old and does heavy work in a factory.—*Roland Hammond, Providence.*

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**OPERATIVE ORTHOPEDICS AS ILLUSTRATED BY A HOSPITAL SERVICE.** By Royal Whitman. *Medical Record*, July 24, 1915.

The author refers to orthopedics as being originally a method of treatment confined almost entirely to the application of plaster-of-Paris and steel braces in the conservative expectation of results. He says that this has gradually changed so that manipulative and other operative measures in the way of cutting surgery have been added as a more effective and rapid means to the desired end in numerous cases. Then follows a brief review of the cases operated upon during a summer service at the Hospital for Ruptured and Crippled. This report serves to show the great variety of cases and the extent of operative procedures embraced in the field of orthopedic surgery of today.—*H. A. Pingree, Portland, Maine.*

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**ORTHOPEDIC TECHNIC.** James K. Young. *Surg., Gyne. and Obst.*, June, 1915.

The author illustrates the employment of special technic in cases of (1) Total excision of clavicle for osteomyelitis; (2) Forcible reduction of dislocation of ilium; (3) An early operation for psoas abscess; (4) Excision of sac, spinal bifida; (5) A new operation for recurrent dislocation of shoulder; (6) Arthrotomy of knee; (7) Anastomosis of external and internal popliteal nerve for infantile palsy.—*J. A. O'Reilly, St. Louis.*

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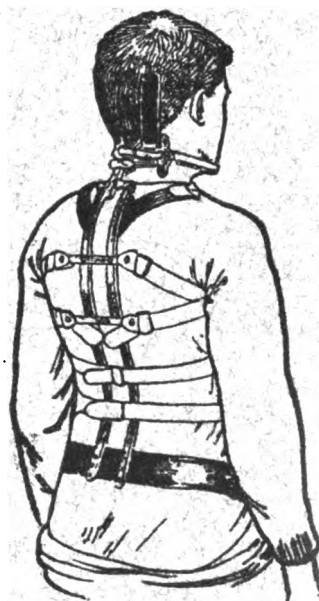
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# *The American Journal of Orthopedic Surgery*

## GENERAL HELIOTHERAPY IN THE TREATMENT OF BONE AND JOINT AFFECTIONS: REPORT OF CASES.

BY WILLIS C. CAMPBELL, M.D., MEMPHIS, TENN.

GENERAL heliotherapy, as advocated by Rollier of Leysin, Switzerland, has received world-wide attention from those interested in the treatment of surgical tuberculosis and certain skin affections, but the remarkable clinical results obtained in tuberculosis of bones and joints makes the subject of paramount importance to the orthopedic surgeon and gives a new impetus to the study of solar light and its effect on the human organism.

General heliotherapy (in contradistinction to local heliotherapy) alone is pertinent to the subject in question, though the beneficial influence of the sun's rays has been known since ancient times. Downs and Blount in 1877 proved the antiseptic action of sunlight. The following year (1878) Downs and T. P. Hunt showed that the bactericidal action of sunlight was materially inhibited unless in the presence of free oxygen. However, sufficient evidence as to how the rays act as a curative agent in disease has not been produced, and such treatment at the present time must be regarded as purely empirical.

Bernhard of Somaden, Switzerland (1700 m. above sea level), noticed that the farmers hung their meats out in the sun to dry, and used this antiseptic drying method for living tissues in his sanitarium in 1902, and was the first to consider altitude of special advantage in *local heliotherapy*. Rollier, encouraged by Bernhard, established an institution at Leysin in 1903. He now has three sanatoria, at different altitudes,—1250, 1350 and 1510 meters above sea level, respectively.

Tolerance of the body to the action of the sun and air is acquired by gradual exposure, the details of which are minutely described by Hammond of Providence and Detrich of Los Angeles. Rollier believes that all surgical tuberculosis is a general infection with local manifestations, for which he exposes the entire body from three to seven hours

daily. In addition, extension and braces are used to some extent for the prevention of deformity, but all apparatus is removed as much as possible during exposure.

He regards the ultra-violet or actinic rays as the curative agent, and calls attention to the fact that all parts of the spectrum (red, orange, yellow, green, blue, indigo and violet), and the invisible spectra (ultra-red and ultra-violet) are more intense at high altitudes, and that seasonal variations in the width of the spectrum are not so marked as in the lowlands. Such variations he thinks are due to the formation of ammonia and nitrous compounds in the atmosphere from electrical phenomena, especially in the warmer months, which contracts the invisible spectra (ultra-red and ultra-violet), thus decreasing the effect of the solar treatment in summer, while in winter there are few sunny days in low countries, and the cold damp atmosphere, with excessive wind currents, does not permit general exposure. On the other hand, at high altitudes there is less seasonal variation in the spectrum, more sunny days, and the air is pure, still and dry, permitting almost continuous insolation. De Quervain, Hüsey, Bernhard, Bardenhauer, Witmer and Hirschberg concur with Rollier. On the other hand, A. Tréves, Barbarin, D'Oelnitz, Andion, S. Koffman, Jerusalem, and others, consider heliotherapy equally effective in the lowlands.

Richards and Felten-Stoltzenberg, working by the North Sea, state that cures may be obtained in three or four months at the seashore, as compared to nine months to one and one-half years in the mountains. P. Andion reports excellent results at Berck-Sur-Mer, but his cases received local heliotherapy as an adjuvant to marine treatment. S. Koffman, who has a sanitarium on the Black Sea, near Odessa, Russia, considers heliotherapy effective everywhere except in the cities. A. Tréves has visited Leysin and regards October, November, March and April as unfavorable in the mountains, and thinks that altitude is only an advantage when pulmonary tuberculosis complicates. Von Schroëttter suggests an exchange of patients between sanitarium in the lowlands and those in the highlands for the promotion of cures.

Since Rollier's article in 1909, there has been an increase each year in literature of the subject, and many have visited Leysin, to be favorably impressed, but no one has been more enthusiastic than Bardenhauer of Cologne, who previously possessed radical views regarding the treatment of joint tuberculosis. After seeing the work at Leysin he states, "Resection with all its fine results loses its value, when compared with the sun-treatment." Witmer, an assistant at Leysin, gives the following statistics in 1912:

## STATISTICS FROM LEYSIN.

	Cases.	Cured.	Improved.	Station.	Died.
Spondylitis without abscess.....	52	44	7	—	1
Spondylitis with abscess.....	28	25	1	1	1
Spondylitis, secondary infection.....	14	7	3	2	2
Pelvic tuberculosis not infectious.....	9	6	3	—	—
Pelvic tuberculosis, secondary infection...	10	2	—	3	5
Coxitis without abscess.....	39	36	3	—	—
Coxitis with abscess.....	18	15	2	1	—
Coxitis, secondary infection.....	24	8	6	3	7
Gonitis without abscess.....	50	46	2	2	—
Gonitis with abscess.....	9	7	2	—	—
Gonitis, secondary infection.....	8	6	1	1	—
Tuberculosis of foot without abscess.....	14	13	1	—	—
Tuberculosis of foot with abscess.....	10	8	—	1	1
Tuberculosis of foot, secondary infection..	21	16	4	1	—
Shoulder without abscess.....	2	2	—	—	—
Shoulder with abscess.....	2	1	1	—	—
Shoulder, secondary infection.....	3	—	3	—	—
Elbow without abscess.....	3	2	1	—	—
Elbow, secondary infection.....	8	7	1	—	—
Hand without abscess.....	4	2	1	—	—
Hand with abscess.....	1	1	—	—	—
Hand, secondary infection.....	6	3	1	1	1
Spina ventosa without abscess.....	3	3	—	—	—
Spina ventosa with abscess.....	3	3	—	—	—
Spina ventosa, secondary infection.....	12	11	1	—	—
Osteitis, pure.....	20	16	4	—	—
Osteitis, secondary infection.....	30	26	2	1	1

Rollier stated at the recent International Congress, according to Barbarin,\* that of 804 with closed surgical tuberculosis, he cured 703, improved 73, 22 remained stationary, and 6 died. Of 328 with suppurating fistulae, 248 were cured, 39 improved, 19 stationary, and 25 died. Straube, who was treated for spondylitis, states that general heliotherapy for this condition was first used at Leysin in 1906, and gives the following interesting report of all spinal cases to 1912:

## STRAUBE'S STATISTICS.

Among the 96 cases of spondylitis are 59 adults and 37 children.

Duration of treatment in children: 1-2 yr., 3 patients; 1-2 to 1 yr., 7 patients; 1 to 1 1-2 yrs., 13 patients; 1 1-2 to 2 yrs., 4 patients; 2 to 2 1-2 yrs., 1 patient; 2 1-2 to 3 1-2 yrs., 6 patients; of others treatment not known.

\* Transactions of late International Congress not yet published.

Duration of treatment in adults: 1-2 yr., 15 patients; 1 yr., 22 patients; 1 to 1 1-2 yrs., 11 patients; 1 1-2 to 2 yrs., 1 patient; 2 to 2 1-2 yrs., 1 patient; 2 1-2 to 3 1-2 yrs., 5 patients.

Of 37 children:

Cured .....	31—84%
Improved .....	4—11%
Stationary .....	1— 2.5%
Died .....	1— 2.5%

Of 59 adults:

Cured .....	46—78%
Improved .....	9—15%
Stationary .....	1— 2%
Died .....	3— 5%

Of 16 children without abscesses:

Cured .....	13—86.3%
Improved .....	2— 9.2%
Stationary .....	1— 4.5%

Of 11 children with closed abscesses

Cured .....	11—100%
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Of 4 children with fistulous abscesses:

Cured .....	1—25%
Improved .....	2—50%
Died .....	1—25%

Of 23 adult patients without abscesses:

Cured .....	15—65.2%
Improved .....	6—26%
Stationary .....	1— 4.4%
Died .....	1— 4.4%

Of 25 adult patients with closed abscesses:

Cured .....	23—92%
Improved .....	2— 8%

Of 11 adult patients with fistulous abscesses:

Cured .....	8—73%
Improved .....	1— 9%
Died .....	2—18%

Of the 29 children data only of the following are known:

2 patients have remained well 6 years.	
4 " " " " 5 "	
1 " " " " 4 "	
1 " " " " 3 "	
5 " " " " 2 "	
7 " " " " 1 "	
9 " " " " a few months.	

All these patients are still well.

No comparison can be made with reports from Leysin as sufficient time has not elapsed, though general heliotherapy is being extensively used by many, especially in Europe.

Considering the subject from a clinical standpoint, Rollier makes the following observations:

1. There is increase in weight, hæmoglobin and red blood cells.
2. Sun's rays have a resolving and sclerogenous action.
3. Blondes, especially red blondes who freckle, are cured more slowly.
4. Articular function better preserved.
5. Ankylosis often gives articular function.
6. Sinuses and abscesses rapidly heal.
7. Pigmentation.
8. Average time to effect cure, 6 months to 1 1-2 years.

Hammond shows a greater increase in weight and hæmoglobin in a group of cases treated with marine treatment and heliotherapy than with marine treatment alone. That bony ankylosis may give articular function is denied by A. Tréves and Koffman, though it is inconceivable that Rollier intends to convey such an impression. Gauvain, Andion, Doche, Barbarin, Koffman and others are impressed with the remarkable results obtained in septic cases and in those with old sinuses, many of which have resisted treatment for years.

Regarding pigmentation, Rollier states, "We have found that the power of resistance of the patient increases in the same measure as pigmentation of the skin." Gauvain observes, "No benefit is obtained until pigmentation is established." Finsen regards pigmentation as a protection of nature against the ultra-violet rays, while Rosselet thinks the pigment in addition transfers the short wave chemical rays (ultra-violet) into rays of long waves and deeper penetration for which he uses the term "Transformator."

D'Oelnitz does not consider mensuration of intensity of sunlight of value in determining dosage. He finds that eosinophilia exists after a few hours' exposure, and also after marine treatment, so concludes that heliotherapy and marine treatment are different means to the same end, to which Zadro and J. Andrieu agree.

All writers regard light as a powerful tonic, but some doubt its special action on tuberculous lesions. A. Tréves says that orthopedic treatment is neither shortened nor suppressed, but rendered more difficult by heliotherapy, and that superficial lesions alone receive benefit. He does not think that heliotherapy has any influence whatever on the evolution of the process, and is doubtful as to the quality of the cure, to which J. Andrieu fully concurs.

Heliotherapy is not often used in treating affections of bones other than tuberculosis. Jerusalem reports one case of osteomyelitis as cured, and Hammond uses the method as an adjuvant in the treatment of bone



disease, but no differentiation is made. Otherwise there could be found no further reports of non-tubercular conditions so treated.

I have used the sun treatment in 28 cases, in eight of which sufficient time had not elapsed to obtain results. In four with fistulae improvement was rapid in three, but for various reasons exposures could not be continued. Of the remaining 16 in which the treatment was satisfactorily given, 7 were tubercular, 4 osteomyelitis, 2 pneumococcic arthritis, 1 peri-arthritis following direct infection of knee joint, 1 arthritis deformans, 1 decubitus.

All with the exception of Case 1 were treated within the City of Memphis, Tennessee, which is about 200 feet above the sea level, having according to S. C. Emery (local U. S. Forecaster) a mean temperature of 61.7° F. (winter 42.5, summer 79.4); average number of rainy days per year, 115. Patients have been exposed every month in the year, but more continuously from March 1 to December 15. No method of fixation except the Bradford frame and extension has been used and no medication except an occasional light purgative. For the sake of brevity, only the essential facts in the histories are given.

CASE 1. J. H. S. Male, age 22. Very healthy until February, 1912, had pain in left hip and thigh. Symptoms gradually increased in severity until he was admitted to the City Hospital, Sept. 1, 1912. Diagnosis of "Pott's disease" was made by Dr. B. N. Dunnivant, when he was placed on a Bradford frame, where he remained until my services began, Nov. 1, 1912. He appeared on examination in fair condition. A small knuckle could be seen about ninth dorsal vertebra, spine rigid, slight swelling to left of lumbar region. Hip slightly limited in all directions, but to greater degree in hyperextension. Skiagrams show partial destruction of ninth dorsal vertebra, left hip negative. Diagnosis: Tuberculosis ninth dorsal vertebra with psoas abscess and probable invasion of left hip joint. A cast was applied and patient returned to his home in the country under excellent hygienic conditions. February 26, 1913, returned to hospital, having afternoon temperature of 104.3-5°. Left hip painful and restricted by muscular spasm. After removal of the cast extreme emaciation was conspicuous. He is 6 feet, 3 inches, in height and weighed 75 pounds. A large fluctuating abscess covering the entire lumbar region was incised and about one quart of thin yellow pus escaped, after which there was excessive drainage, but no abatement of fever or other symptoms. On March 2, 1913, he was moved to a farm house five miles from the city and placed face down on a Bradford frame with sand bag under upper thorax. This position was strictly maintained throughout treatment. The weather was intensely cold (24° above zero) and the ground covered with snow, but the

first exposure was given to the upper and lower six inches of the body, daily increasing in surface and time of insolation, until at the end of one week the entire posterior half of the patient was exposed half an hour per day. In three weeks deep pressure sores developed over the crests of both ilia, left greater trochanter and patellae. The range of temperature was somewhat lower, otherwise there was no change in the general condition. From this time pigmentation was rapid, as was improvement in all symptoms. By May 1 the body was almost bronzed, abscess and pressure sores having entirely healed. Considerable gain in weight was evident. Temperature, 98 to 99.2-5. The small kyphos had disappeared, and very slight, if any, muscular spasm remained. Left hip was rotated externally with beginning ankylosis. On June 15 no evidence of his former condition could be found, except ankylosis of left hip, but treatment was continued until August 12. By Sept. 1, 1913, he had returned to work in his father's broom factory. Duration of treatment, 5 months and 10 days, since which he has been in excellent health. Weight Sept. 14, 1914, 187 pounds, a gain of 112 pounds. The X-ray shows bony ankylosis of the hip and spine. There is external rotation of the hip, but no shortening. No form of support whatever has been used.

CASE 2. V. G. Negro girl (black), age 8 years. Entered orthopedic services of City Hospital April 1, 1913, presenting every evidence of well-advanced tuberculosis of left hip joint, which showed 50 degrees flexion deformity with abduction, and external rotation. Skiagram confirms diagnosis. Solar treatment was instituted at once and carefully carried out six months, with some improvement in local symptoms and general condition, but no greater than might be expected from other measures. Further pigmentation was not visible on account of the natural color of the patient, which may prevent penetration of the ultra-violet rays.

CASE 3. O. C. Age, 5 years. Was first seen at office Jan. 21, 1913, at which time there was well-developed kyphos about the ninth dorsal vertebra, with every symptom of tuberculosis of that region. Skiagram shows partial destruction of ninth dorsal vertebra. Plaster cast applied in hyperextension, which proved unsatisfactory, as efficiency of support was rapidly destroyed by excessive enuresis, and circumstances were such that parents could not return as often as necessary. Calot jackets were later applied, but there was a gradual increase in deformity, until a well-marked kyphos developed. April 25, 1914, entered orthopedic service, Baptist Memorial Hospital. Cast was removed and patient, in fair condition, placed on a Bradford frame as previously described. Heliotherapy given until Oct. 15, 1914. Improvement was rapid, all symptoms disappearing by July 15, with a decided gain in weight and general condition. Movements of the spine were recorded by moving pictures. On Oct. 1 patient was allowed to walk, using Taylor brace on account of

deformity in the growing child, which had not been reduced by treatment. Comparison of skiagrams at the time of first exposure, and when treatment was discontinued gives every evidence of rapid healing. His parents insisted that he could be given treatment at their home, for which reason he was reluctantly dismissed from hospital, but I am sure this has not been carried out as promised, though they write that improvement continues.

CASE 4. P. G. Girl, 3 years of age. Was first seen at office Dec. 5, 1911, giving history and usual symptoms of tuberculosis of the right hip joint, to which the X-ray findings agreed. Recumbency on Bradford frame with extension was used eight weeks, after which a long spica on Bradford frame for six months, when plaster spicas were continued and walking allowed, until April 23, 1913, acute exacerbation of symptoms arose. During the entire treatment she had gained in weight and her general health had been fair. There was a bare 3-8 inch shortening, with perfect position. Successive skiagrams showed gradual encroachment on the head of the femur and acetabulum. May 4, 1913, patient was placed on Bradford frame with light extension and exposures begun, at which time there was extreme pain on the slightest movement, with considerable periarticular thickening. By July 4, the body was deeply pigmented, and there were no symptoms except slight pain on motion. There seemed to be beginning ankylosis. Sept. 15, 1913, there was apparent ankylosis with no pain on manipulation. Nov. 10, 1913, skiagram shows no space between acetabulum and head of femur. Short plaster spica applied and walking allowed. I did not have the courage of my convictions at this time to discontinue all support. Since there has been no return of symptoms. Casts were discarded March, 1914. Unfortunately, skiagrams in the case were broken.

CASE 5. G. M. Boy, age 5 years. Presented for examination June 13, 1914. Had been quite healthy until abscess of glands in neck, July, 1913. Mother noticed slight knuckle on upper dorsal region of spine about September, 1913, and also shortness of breath. Has had frequent attacks of abdominal pain, and at present has difficulty in walking. Patient is very thin and pale with protruberant abdomen. Small kyphos, upper dorsal region; clubbing and cyanosis at tips of fingers and toes (osteoarthropathy). Stiffness in upper dorsal region, walks with spastic gait. Knee reflexes increased (beginning Pott's paraplegia). Diagnosis evident, which is supported by skiagram showing definite changes in second dorsal vertebra. Placed on Bradford frame June 20, 1914, with four-pound head traction. July 1 exposure of upper and lower four inches; July 7, entire body. August 1, 1914, decided improvement in all symptoms. Oct. 1, 1914, deep pigmentation, child appears robust with excellent color. Knee reflexes normal. No muscular spasm, and motion in all directions without pain. Jan. 5, 1914, improvement has continued,

but exposures have been affected by the early winter and the fact that the mother cannot be induced to remove clothing unless comfortable to the child. To all appearances patient seems entirely well. Skiagram shows beginning ankylosis of several adjacent vertebrae. He will not be allowed to walk until the weather permits three months' continuous exposure, after which, walking with no support, but daily sun bath the remainder of the summer.

CASE 6. S. D. Girl, age 7 years; light blonde type. Was seen at office Sept. 3, 1912. Diagnosis tuberculosis of right hip joint. X-ray confirms. Treatment, ambulatory fixation until Jan. 4, 1914; patient again had night cries and pain in hip, which was swollen and tender, with perceptible fluctuation. Evening temperature 101. Evidently abscess. Long spica applied with relief of symptoms and gradual decline of fever. April 1, 1914, on removal of the cast, tenderness, muscular fixation and abscess remained, though somewhat diminished. There was 3-8 inch shortening of right lower extremity. July 1, 1914, slight pigmentation. Arc of motion possible about 10 degrees. No pain. Abscess cannot be palpated and is apparently absorbed. Temperature normal. Sept. 1, 1914, pigmentation deeper with marked increase in hair over the entire body. Bony ankylosis apparent, otherwise no symptoms can be found. Oct. 1, 1914, patient being of blonde type did not undergo deep pigmentation, but cure seems to be real. Walking allowed without brace of any kind and without the slightest recurrence to the present time; no further shortening. Length of time treated, 6 months.

CASE 7. Capt. G. Age 47; river pilot. Seen Nov. 17, 1913. Heart and lungs negative. Urine, 30%; albumen microscopically, numerous pus cells, red blood cells; degenerated kidney epithelium and detritus. Had suffered with severe pain in both thighs and spine past two years. Diagnosis from clinical findings and skiagram: tuberculosis of the eleventh and twelfth dorsal vertebrae. Recumbency and plaster jacket gave relief, but patient insisted on returning to work Feb. 1, 1914, when symptoms promptly recurred March 20, 1914. By courtesy of Dr. Kollock, Senior Surgeon, Public Health Service (local U. S. Marine Hospital), heliotherapy begun in that institution, which was continued with gradual improvement, until he died suddenly May 10, 1914. Cerebral embolism given as cause of death. Post mortem shows advanced tuberculosis both kidneys, double psoas abscess, and caseation and degeneration of eleventh and twelfth dorsal vertebrae. No permission obtained to enter cranium.

CASE 8. Miss A. B. Age 30; schoolteacher. At age of nine was operated for osteomyelitis of shaft of right tibia, after which part healed, and there were no further symptoms until June, 1913, when osteomyelitis again developed at same location. A second and more radical

procedure by a very competent surgeon did not relieve the condition, and there remained at the end of one year a discharging cavity over the upper third of the tibia. On June 10, 1914, she was admitted to my service at the Lucy Brinkley Hospital. June 11, 1914, about the anterior two-thirds of the shaft, except upper and lower, 1 inch was removed. Heliotherapy begun July 1, 1914, the wound being directly exposed to the rays. Healing progressed uninterruptedly until July 25 sufficient new bone had developed to allow weight bearing. By Oct. 1, 1914, wound entirely healed, and she was able to resume her duties as school-teacher. A recent letter states that she has suffered no further inconvenience and can use the affected limb as well as ever.

CASE 9. L. R. Boy, age 12. No serious illness until July, 1914, had two boils on back, which was followed by high fever and pain in upper third of left tibia and lower third of right femur. Later, abscesses formed at these points and were lanced August, 1914, since which sinuses have continued until first seen at the Baptist Memorial Hospital, August 24, 1914. Chronic osteomyelitis was quite evident. Skiagrams show distribution of process, which was limited to lower third of right femur and upper third of left tibia. General condition good. Aug. 27, the posterior three-fourths of the lower third of right femur was removed, leaving a thin bridge of bone between the epiphysis below and middle third of shaft above. Two weeks later similar procedure to the upper third of left tibia. Patient reacted well from each operation, and solar treatment was begun Sept. 15, 1914. This was carried out at the hospital for two weeks, when he was removed to his home in the city. On Nov. 15 walking allowed. Wounds have gradually healed, until at present there is only slight serous discharge from both, which are superficial. A number of small sequestra were frequently extruded. The general condition has also materially improved, and the patient is able to run about as would any normal boy of his age, but it has been impossible to compel the mother to keep up the treatment during the winter months.

CASE 10. V. M. O. Girl, age 3 years. Was first seen July 2, 1914, when she entered my services at the Lucy Brinkley Hospital. Early in May she had a "Whitlow" on the index finger of her left hand, which remains red and inflamed at present time. This was poulticed until opened by nature one week later. About this time there was severe pain in right leg and high fever, which continued until she entered hospital. Examination: Emaciation extreme; lungs negative; pasty color; heart rapid; urine, trace of albumen, hyaline and granular casts; temperature 103. Half way between umbilicus and symphysis was small abscess about the size of walnut. Effusion in right knee joint, with 20 degrees flexion. Right leg swollen and very tender over tibia. No fluctuation, no thickening of bone. In skiagram upper third of tibia throws very

faint shadow; bone appears degenerated and eroded. Diagnosis, osteomyelitis. July 3, 1914, upper third of shaft removed to epiphyseal cartilage. Periosteum closed with fine catgut, gauze drain into cavity, extension applied to knee. Rollier treatment begun July 4, 1914. Aug. 1, 1914, child well tanned, general condition much improved, wound healthy. Slight serous discharge. Temperature normal. Sept. 1, 1914, wound healed except superficial area with healthy granulations. Skiagrams show deposit of bone sufficient to allow walking. Oct. 1, 1914, wound entirely healed, child plump and healthy in every way. Scarcely perceptible limp. Patient discharged, since which I have heard at regular intervals that no further symptoms have occurred. Jan. 20, 1915, patient called at my office in excellent condition, with affected part apparently cured. X-ray shows complete reproduction of tibial shaft.

CASE 11. W. R. Osteomyelitis lower two-thirds of left femur and upper one-third of fibula, of six months' duration, having had two previous operations. Sinus inner aspect of thigh two inches above knee. Operation July 4, 1914. Removal of sequestra, lower two-thirds of femur and sub-periosteal resection of upper third of fibula, after which there persisted copious purulent discharge, with daily temperature 99 to 101. At the end of one month his condition, which was very poor, had become desperate. Sun treatment begun, Aug. 4, 1914, and was continued until Oct. 10, with rapid and marked improvement, the temperature falling to normal within two weeks. The discharge, at first copious, soon became serous, gradually decreasing until the fibula and the parts below knee healed, leaving a small sinus inner aspect of thigh about 1-2 inches above knee joint. The days became a little cooler in October, illness occurred in the family, and the exposures could not be enforced, since which there has been no further effort to heal, and several small abscesses have formed. However, the infected area at present seems to be limited to the lower epiphysis of the femur.

CASE 12. M. F. Girl, age 7 years. Entered orthopedic service of City Hospital Feb. 15, 1913. Parents morphine habitués and had given child drug since birth. November, 1912, had lobar pneumonia, followed by pneumococcal infection of the right hip joint, which was held rigid in 130 degrees flexion, distended and markedly tender with fluctuation. Emaciation extreme, albumen present, no casts. Temperature, 102° F. A picture of long-continued sepsis. Hip incised and drained; considerable amount of thin yellow pus escaped. At the end of three weeks, there being only slight improvement, an attempt was made to secure better drainage, and the malposition gradually corrected by extension. Skiagrams at this time show the head of femur eroded and the superior border of acetabulum destroyed, with dislocation. By April 10 wounds had not healed, purulent discharge continued; patient gave every appearance of amyloid disease, though no waxy casts could be found.

April 11, 1914, heliotherapy instituted. The rays were well borne and she was able to take large doses from the start. Pigmentation was rapid, as was local and general improvement. By June 1 there was perfect healing of the wounds, and the child was very plump and in every way normal, except dislocation of the hip, which will require further attention at a subsequent time.

CASE 13. A. S. Age, 18 months. Was first seen at St. Joseph's Hospital Feb. 7, 1914, giving the following history: Six weeks previously had broncho-pneumonia, two weeks after onset of which had double otitis media, with rupture of both ears. Three weeks ago noticed slight swelling in left hip joint with pain and tenderness, which has gradually increased. On examination, temperature 104, pulse 150, extreme emaciation. Left hip flexed, very tender with perceptible fluctuation. The hip joint was at once incised posteriorly with evacuation of pus, drain inserted and cast applied. Feb. 8, temperature not over 101 degrees, but was a fraction higher each day until Feb. 15, when the temperature reached 105.3-5, when an empyæma in right side was located by Dr. E. C. Mitchell, and section of ninth rib was made in axillary line by Dr. Hill. The condition was desperate, no anæsthetic being advisable. Much to our surprise, there was no abatement of fever or improvement in other symptoms. Both ears, thorax and hip joint continued to discharge profusely. No other focus of infection could be found and the condition seemed hopeless. On March 10, 1914, though very windy and cold, as a last resort, the solar rays were given a trial. No improvement could be seen for one week, at the end of which time the temperature did not go over 103, after which improvement was gradual but decided until April 1, when there was a rapid subsidence of all symptoms. By April 20 the chest, hip and both ears had healed. The child had gained materially in weight and was returned to his home in the country, where the treatment was continued until July 1, at which time there was a slight limp; otherwise he was strong and healthy.

CASE 14. N. P. Age, 10. March 2, 1914, while playing with brother, fell on sharp pointed scissors, which penetrated right knee joint; virulent infection followed, and for six weeks her condition was very grave. Was first seen with Dr. A. B. DeLoach, her family physician, June 12, 1914, at which time the joint was held rigid in the extended position. The lower third of thigh and knee joint was tender, swollen, boggy and red. Skiagram revealed no change in the bone. Cast was applied for one month, with some decrease in tenderness, otherwise there was no material change in the condition. Solar treatment begun July 15, 1914, with extension at night and during exposures. At other times walking encouraged. Beneficial effect more gradual than in other cases. All swelling and pain had entirely disappeared by Jan. 1, 1915, but no active motion had returned, though passive motion was possible to a very slight degree.

CASE 15. Man, age 32. Probable syphilitic lesion of the cord, causing spastic paraplegia with trophic changes in right lower extremity, on which had developed severe deep pressure sores into the muscles, and over the patella the bone was bare. These occurred as a result of the cast after tenotomies to improve position of limbs. Salvarsan had been previously given and repeated. Wassermann proved negative. In spite of all usual remedies there was no effort to heal. Heliotherapy begun April 15, 1914. Within three weeks all wounds showed healthy granulations, and by July 15 four had healed, while three appeared healthy. At this time patient left the city and treatment was discontinued.

CASE 16. Mr. W. P. Age, 21 years. Spondylitis deformans of seven years' duration. Rollier treatment June 2, 1914, to Aug. 1, 1914, during which time the process invaded the right hip and knee joint. No material improvement could be noticed, and treatment was discontinued.

Blood examinations, tuberculin tests, Wassermann and other reactions were used when necessary to diagnosis and essential to treatment, in every case, but the discussion is confined by preference to the actual changes effected in the general and local symptoms. Radiograms, of course, were made in confirmation of every diagnosis, and later, when able to come to the office, but during treatment X-ray machines were not accessible except in those confined in certain hospitals. No cases are considered when the slightest doubt exists as to diagnosis.

Few results are of sufficient duration to compare with cases treated by the other methods, but the improvement has been so rapid and so real that one feels that a remedy has at last been secured that has a definite action on the local process.

The first seven cases were tubercular. In one the spine and right hip were involved, in three the spine alone, and in three one hip joint. Case 1 is most interesting, having passed from an apparently hopeless condition to a perfect clinical cure within five months and ten days with no recurrence at the end of 18 months, though doing hard manual labor. The failure of Case 2 to respond may be due to the deep pigmentation of the negro, though several negroes with sinuses improved, but could not be induced to continue treatment a sufficient length of time to obtain results. Case 3, an apparent cure at the end of six months, wears light support to prevent further deformity by gravity and growth. A comparison of skiagrams at the beginning and end of the solar treatment shows marked cicatricial changes and bony ankylosis with absorption of exudate. Case 6, though of light blonde type and deficient pigmentation, was apparently cured in six months. In Case 7 death occurred suddenly, before there could be material effect on the local process, and



should not be considered a failure of the solar treatment. Of the six remaining there was no improvement in one. In five, from every clinical observation all were cured in six months or less, though one of these (Case 5) remains in recumbency, successive skiagrams showing rapid cicatrization.

Four cases of osteomyelitis are reported, in all of which the rays were used after operation to insure primary healing without recurrence, which so often happens in this condition. Case 9 improved so long as exposures were given. Case 8, which made little effort to close after a second operation, healed readily when exposed to the sun after third operation. Case 10 shows wonderful improvement in general septic condition as well as healing of local process. Case 9 is conspicuous by expulsion of numerous small sequestra, both wounds showing healthy granulations with slight serous discharge.

In no case were the beneficial effects more striking than in Case 13, pneumococcic infection of both ears, right empyæma and left hip, with rapid subsidence of constitutional symptoms,—complete closure of all discharging points and restoration to perfect health in less than two months. Of the six tubercular cases five were apparently cured within six months or less,

- 1 showing no recurrence after 22 months
- 1 showing no recurrence after 18 months
- 2 showing no recurrence after 8 months

Of the four with osteomyelitis, one improved as long as exposures were continued, two healed primarily, with no recurrence to date. The fourth has slight serous discharge from right femur, the left tibia having entirely healed. There were five intensely septic cases, apparently hopeless, which made a rapid and uneventful recovery.

In conclusion: Besides many observations by others above mentioned, those features which were most interesting to me are as follows:

1. The rapid expulsion of sequestra as mentioned by Franzoni.
2. The marked and early beneficial effect in severe septic conditions (either secondary to tuberculosis or other primary infections) has been most striking (Cases 1, 10, 11, 12, 13).
3. The rapid evolution of the tubercular process, resulting in bony ankylosis in every case, which differs from the experience of Rollier and others, who lay much stress on the mobilizing action of the "rays," though the number of my cases are few and, with one exception, of long duration and showing gross bony changes before general heliotherapy was employed.

4. The length of time required to procure results appears materially shorter than reports from Leysin indicate.

5. There is much difficulty in having the exposures regularly given in well-regulated general hospitals, and in private homes constant espionage is required.

6. As close attention should be given to orthopedic measures for the prevention of the deformity as in any previous treatment, by using removable apparatus and extension.

7. From my limited experience with the method and from comparison with both operative and non-operative methods, I believe that a decided advancement has been made, not only in the treatment of surgical tuberculosis, but in certain other affections of bones and joints.

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## PAINFUL ANTERIOR ARCH OF THE FOOT: AN OPERATION FOR ITS RELIEF BY MEANS OF RAISING THE ARCH.

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THERE are practically two types of anterior, or transverse, arch of the foot which are commonly met with and which give symptoms, namely, the flexible and the rigid. The flexible may be associated with a low posterior or longitudinal arch, pronation or weakness of the ankle, and a general atonic condition of the muscles of the leg and foot; the toes are usually straight. The symptoms in this type may be referred to any part of the leg and ankle, but frequently to the anterior portion of the foot, in the form of intermittent metatarsalgia. The symptoms generally occur when the foot is functioning, that is, when the foot is in a weight-bearing position.

### DESCRIPTION OF THE RIGID REVERSED ARCH.

In the rigid, reversed arch, as I choose to call it, we have an entirely different picture, both in regard to symptomatology, anatomy and physical observation,—namely, in this type we have usually a high posterior or longitudinal arch, a strong ankle, muscles of the leg and foot well developed, the second, third and fourth toes flexed; the second, third and fourth metatarso-phalangeal joints, as a rule, open; and the weight of the patient is borne upon the second, third and fourth metatarsal heads, so that the second, third and fourth toes play very little part in establishing balance, and if they do, are working at a great disadvantage. Deep-seated calluses are found on the flexed toes and under the former anterior arch. These calluses are thick and hard (See Fig. 5), some extending into the tissue one-quarter of an inch, causing constant pressure well nigh into the third and fourth metatarso-phalangeal joints and into the joints of the flexed toes. The symptoms in this type of foot are chiefly localized to the anterior portion of the foot in the region of the former anterior arch. The pain and burning sensation of the skin in these cases is extreme, so that the patient frequently will remain off his feet entirely, or will attempt to use the foot in a faulty manner until the pain becomes so localized that its endurance very frequently impairs the general health of the individual. The pain is most marked in the weight-bearing position, but frequently continues after the weight is removed from the foot, or when the foot

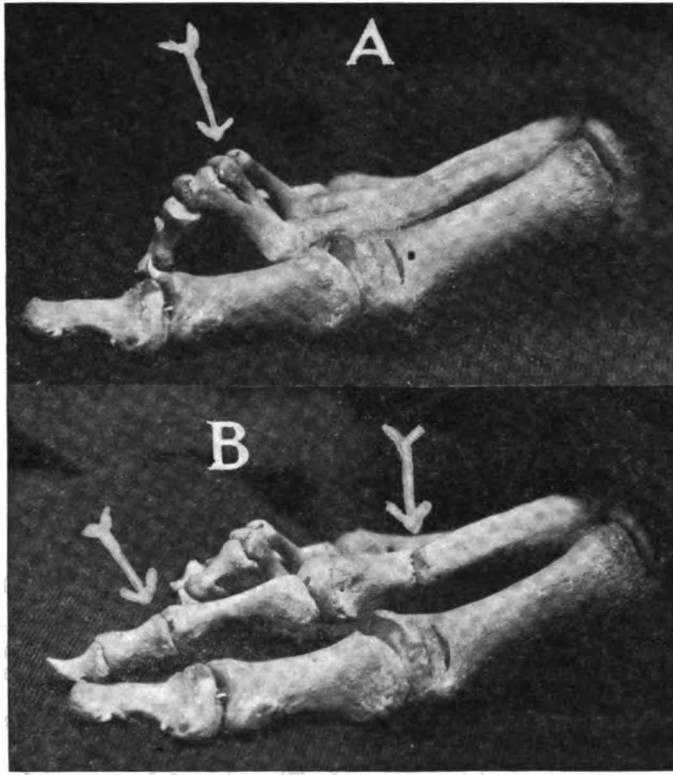


FIG. 1.—Dry specimen illustrating operation before and after.

A. Note flexed toes, depressed heads of second, third and fourth metatarsal bones. B. Operation performed on second metatarsal. (Note elevation of head, straightening of toes, small amount of deformity of metatarsal bone.)

is at rest. The calluses seem to grow in size. In this type, the foot does not tend to spread as much as in the flexible type. In fact, the entire metatarso-phalangeal girdle is anchored down by ligamentous thickening, and even with a tarsoclast it is difficult to restore the anterior arch, even temporarily. The flexor tendons of the second, third and fourth toes are tense and seem to be too short to allow the toes to extend.

#### TREATMENT OF THE TWO TYPES.

Reviewing the treatment of the flexible and rigid arches, it may generally be said that for the flexible, proper plates, proper shoes and exercises give satisfactory results, but in the rigid type, there has heretofore been no effectual and satisfactory treatment for a permanent result. Plates and shoes have given temporary relief, but exacerbation has been

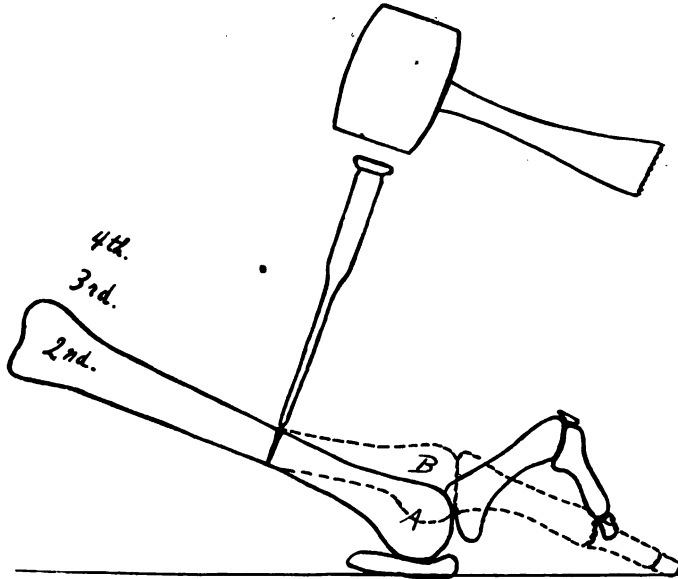


FIG. 2.—Enlargement of shadowgraph made from a dry specimen, illustrating the position of the metatarsal bone and toes (A) before and (B) after the operation. (Note the raised position of the metatarsal head after the operation, and also of the small amount of deformity resulting at the shaft of the bone.) (A shows the position of the toes in Fig. IV before operation.)

very frequently noted, and a constant supervision of the patient is necessary in order to keep him comfortable.

The operation herewith presented (Figs. 1 and 2) has to do with the rigid, reversed arch, and the patient presented had been treated over a period of eight months by various methods, with only temporary relief, and was not relieved of symptoms nor had the calluses disappeared until the operation (which in this case is conservative treatment) was performed.

#### METHOD OF OPERATING.

The mechanics of the rigid, reversed anterior arch before the operation suggested that the second, third and fourth metatarso-phalangeal joints (Fig. 1a) are on a lower level than the first and fifth, and bound down; that is, the metatarsal angle, as described by Hoke, is increased in the second, third and fourth metatarsal bones. The joints are open, and peri-arthritis, due to the thickening of the synovial and surrounding tissue, is present. Normally, the forward weight-bearing joints of the foot should be the first and fifth metatarso-phalangeal joints, and they should be at a lower level than the second, third and fourth. In the rigid anterior arch this is not the case, but the condition is reversed,

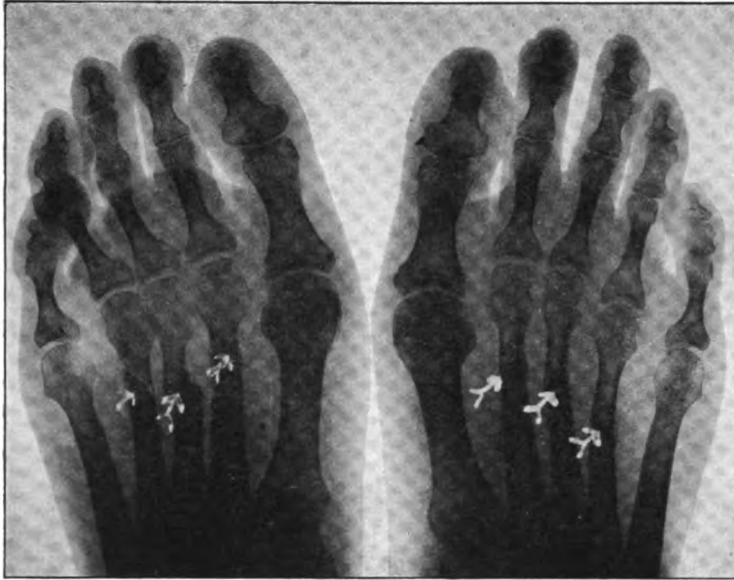


FIG. 3.—X-ray after operation. (Note the small amount of callous formation at the points of osteotomy.)

namely, the second, third and fourth metatarsal heads are at a lower level than the first and fifth, and consequently, must support the body weight. It is considered that if these heads could be raised (Fig. 1b and Fig. 2b) and the relative positions of the second, third and fourth metatarso-phalangeal joints changed, that is, the heads elevated in such a way that the tendons would at the same time act in an elongated position, the result would be to raise the anterior arch, remove the pressure, and straighten the toes, so that the new position would cause the flexor tendons to stretch rather than to contract. Under ether, with the legs of the patient flexed on the operating table and a shot-bag under the plantar surface of the foot, a very narrow osteotome (1-8 in.) is driven in the shaft of the second metatarsal bone 3 c.m. from the metatarso-phalangeal joint space. The cutting surface of the osteotome is first driven parallel with the flexor tendon of the given integral, so as to avoid the tendon, and driven slightly oblique, until the periosteum has been cut through. It is then forcibly turned at right angles to the shaft of the metatarsal bone and the cortex of the bone chiselled through, as in osteotomy. During this procedure and the following, the assistant is instructed to hold the toes firmly and at no time during the entire operation to let go. Similar procedures are practised on the third and fourth metatarsal bones.



FIG. 4.



FIG. 5.

FIG. 4.—Feet after operation. (Note the toes are straightened and there is no deformity of the foot. The marks of the old calluses on the toes are evident in the illustration.) Anterior arch high and flexible.

FIG. 5.—After operation. (Showing the deep-seated calluses over anterior arch, which are beginning to loosen.) N.B. Patient with these feet seen a year after this illustration was made. Examination shows no callus under anterior arch. Anterior arch high and flexible.

After the fourth metatarsal bone has been divided, the surgeon places his hand underneath the anterior arch, and with a gentle pressure raises it. It will then be noted that the toes jump forward as if the tendons had been divided, giving the result desired. It might be said that this is a critical point in the technic and the management of the operation. Hard felt pads, which have previously been cut in a beveled oval, should then be placed underneath the anterior arch somewhat obliquely, in a line from the tuberosity of the scaphoid to the center of the anterior arch. The felt pads should be held in position by means of adhesive, extending from the first to the fifth metatarsal heads, and quite wide. After the sterile dressings are applied, the foot is put up in a plaster dressing extending to the knee.

In a paper written by Michael Hoke in connection with equinovarus, Hoke has used an osteotomy by open incision for the purpose of rotating the metatarsal bones in relapsed and untreated cases of club-foot. He also states that the anterior arch can be raised by this method, "providing that the toes are not claw toes." However, Hoke has divided his metatarsal bones high up, as against the foregoing operation, and has also divided the first and fifth.

#### NOTATIONS ON THE OPERATION.

The two cardinal points to be considered in attempting to give relief to this otherwise stubborn condition are: *a*, choice of foot; *b*, the points of technic.

In the choice of the foot, as has before been said, it should be that type with flexed toes and deep-seated calluses (Fig. 6), with the flexor ten-



FIG. 6.—Type of foot to which author's operation is especially adapted. (Note the claw toes of the 2d, 3d and 4th; also the callous formation, and the low anterior arch.)

dons pulling at a faulty angle, in which the pain is localized to the anterior arch or to the toes, and which cannot be relieved by ordinary methods. The aim of the operation is to place the metatarso-phalangeal joints in a better position, so that the toes will straighten and that the flexor tendons of the toes will pull in a straight direction rather than at an angle (giving the same result as bone resection in hammer toe) (Fig. 1, a and b). In order to obtain this, the osteotomies must be made at the correct distance from the metatarso-phalangeal joints. This point has been found to be about 3 cm. from the metatarso-phalangeal joint space. In doing the osteotomies, a green stick fracture is better than a through-and-through osteotomy.

In raising the arch at time of operation, care must be taken not to have overriding. The advantages of the operation are: The immediate relief of symptoms, with the early dropping-off of the calluses, the straightening of the toes, with a high anterior arch and no deformity of the foot. In addition to this, the operation is practically bloodless, and the danger of infection is practically nil; the metatarso-phalangeal joints are not open and the heads of the metatarsal bones are not resected. It is my belief, confirmed by Hoke, that this method is a conservative one, treating the hitherto unrelieved condition.



## ARTHROPLASTY OF THE INTER-PHALANGEAL JOINTS.

BY JOHN PRENTISS LORD, M.D., F.A.C.S., OMAHA, NEB.

THERE has been practically nothing reported of arthroplasty of the interphalangeal joints. Having undertaken to relieve some cases of stiff fingers and some with congenitally contracted and pathologically dislocated fingers, and having scored more or less success, I am emboldened to report the results. Free fat and fascia from the fascia lata were used in these cases. In the cases ankylosed from arthritis deformans, there were no normal joint surfaces remaining, and free removal from both bones was made. The resulting space was filled by a piece of fascia lata with attached fat. The wounds were closed by subcutaneous double naught chromic catgut. The skin was accurately approximated by horsehair sutures. This seemed necessary to make the wounds amply tight to retain the grafts. In some of the joints operated later the tendency towards extension was made less by leaving flexed fingers in their original position and straightening them after the wounds were healed. The majority of the joints were operated under local novocaine (1-400) analgesia. The tourniquet is desirable but not necessary. Bleeding should be well controlled before the transplants are placed and the wounds closed.

The utility of arthroplasty in the large joints is established. The literature has become considerable, the successes are common, and good results are to be expected, in a considerable percentage, under proper conditions, and a mastered technic. The reestablishment of motion in a stiff limb is a matter of great consequence to its possessor. It is but natural, therefore, that the joints of major importance should have been first attacked, and that the minor joints should be the last to receive attention. Stiff fingers too much in the way are frequently cut off and thus disposed of, or their presence is tolerated. It rarely happens that all of the fingers and the thumbs become hopelessly ankylosed. It is, therefore, seldom that these conditions actually demand relief. It is quite apparent, therefore, that this field for arthroplasty is relatively limited. An extensive search has failed to find anything more than allusions to arthroplasty upon the phalangeal joints.

The development of arthroplasty in the larger joints has been a more or less slow, evolutionary process. To get into its developmental history would be inadvisable, perhaps profitless, at this time. Arthroplasty in

the small joints has had the advantage of fundamental first principles, having been established by ample practice in the larger field. Disadvantages have arisen, however, because of the peculiarities of the small joints. The stiffened, shiny, attenuated fingers, of those long sufferers from multiple arthritis, furnish scant material for interposition; so sparse indeed, as to suggest free fat and fascia as the material to be preferred. The large masses of free fat and fascia required in the major joints have precluded its successful use in them. The relatively small proportions required in the small joints have been favorable to success. But one transplant in more than a dozen transfers was lost. The cause of this was an imperfect suture, which allowed the graft partly to escape. Pressure necrosis and absorption may be factors to be regarded in the arthroplasty of flexed joints. The reports of Axhausen of experiments upon animals showed that the circulation was not early established in the transplants, and that necrosis invariably takes place, and that it was not necessary for them to live. In arthroplasty of the large joints in which pedunculated flaps are used, it becomes very necessary to provide adequate extension to prevent an amount of pressure which would impair or destroy the circulation in the interposed flaps. Extension upon the fingers may be possible, but it has not seemed feasible in my cases. Indeed, we do not know that it is at all necessary. It would not be required if straight, stiff fingers were always dealt with. In my experience most of them have been flexed and stiff, and sometimes with an amount of pathological dislocation that necessitated excision of perhaps one-third to one-half of an inch of the proximal articulation to render straightening possible. In most of the joints there seemed to be an undesirable pressure upon the transplants on account of too little space for them. This condition suggested the desirability of extension to separate the bone ends and to preserve the substance of the grafts. The excision of more bone than one-third the length of the phalanx seems to be contraindicated for mechanical and functional considerations.

Of the ten interphalangeal joints, in which I used attached flaps of ligament, fascia and fat, six have been done over and free fat and fascia used. More bone was removed and better results were secured. In a few of these, injections of yellow vaseline were also resorted to later with some apparent benefit. Robert Morris has used, in cases of arthritis, an artificial synovia composed of boro-glyceride, 8 parts; water, 1 part, and sufficient sod. chloride to render it iso-tonic. This and other solutions may possibly be made to supplement the grafts, or better still, if we can better treat these cases of arthritis, which is

so destructive to the joints, and use an artificial synovia as suggested by Morris, it may be within the horoscope of possibilities to avoid the necessity of arthroplasty in many more cases than we now do. It is to be borne in mind, however, that Morris' work has been to save joints whose function had been threatened by an acute process.

It has been the experience of those who have done the Hoffman operation upon the feet, that the extensive excision of the heads of the metatarsals, recommended by that author, always results in free and painless motion. It has been my experience that rather free (three-fourths inch) excision of the heads of the metacarpals has been advantageous in restoring motion to these joints, when ankylosed. These articulations have been the easiest and most satisfactory of any in my experience, except, perhaps, the metatarsals where free motion is not necessary. The flaps of adjacent ligament fat and fascia are readily obtainable and satisfactory results have been easily secured. Arthroplasty, by any method, in the interphalangeal joints has seemed to present difficulties peculiar to them.

First, scant material for pedunculated flaps, the material of choice according to our present experience.

Second, lack of space for adequate interposition of free fat and fascia transplants in some joints.

Third, inadequate bony surfaces to favor a stable or straight finger.

Fourth, too prolonged splinting necessary to secure straight fingers which lessens the chances of good motion.

Fifth, the frequent existence of adhesions, the result of tenosynovitis.

While my results have been somewhat disappointing in the interphalangeal joints of the fingers, I may say that a majority of the joints have been greatly improved, some to the extent that the patients were satisfied because fingers became usable, whereas before they were almost useless. Free full motion was obtained in none. Some joints, with a chronic arthritis, lingering and somewhat painful before operation, became painless afterwards. Fingers that were so flexed and distorted as to prevent the wearing of gloves were made sufficiently straight and stable to permit ladies to indulge this feminine prerequisite of a finished toilette.

One of my patients, a maiden lady of thirty, reports as follows: "There are altogether fifteen joints that have been operated on; ten of these are a decided success; the three that had a second operation, I hope still have time to gain, and only two were not helped at all. My hands now are fairly straight where they were badly drawn and mis-

shapen, and almost perfectly stiff. I much prefer them as they are now, rather than as they were."

In Phemister's review, in the *International Abstract of Surgery*, of the subject of free tissue transplantations, that author epitomizes the present consensus of opinion and practice of arthroplasty:

"In the mobilization of ankylosed joints, free and pedunculated flaps of various compositions have been placed between the ends of the bones to prevent the recurrence of fibrous or bony union and to aid in the formation of a new joint cavity. Of these agents, which include fascia, fat and fascia, muscle and prepared animal membranes of various sorts, fascial or fat and fascial flaps have proved to be the most satisfactory, both in animal experiments, such as those of Sumita and Allison and Brooks, and in operations on man, as shown by the results of Murphy, Payr, and many others. According to Allison and Brooks, there is no difference in behavior between a free and a pedunculated flap of fascia when placed between the ends of the bones. In both instances the flap undergoes necrosis and absorption, but by causing exudation and separating the ends of the bones for from two to four weeks, it permits of the formation of a fibrous coat over each end, and a capsule partly reforms, leaving a joint cavity filled with a slightly bloody or serous fluid. Without the implant, less exudation occurs and fibrous union between the bony ends results. Heteroplastic substances interposed, such as Cargyle membrane, chromacized pig's bladder, etc., are more rapidly broken down, cause much more reaction and exudation and stimulate an overproduction of connective tissue (or callus) from the ends of the bones, resulting in a fibrous union which later on may ossify. On the other hand, Sumita claims that while the free transplant breaks down and disappears, nearly all of the pedunculated flap lives. The flap as a result of squeezing and crushing between the movable ends of the bones becomes edematous and hemorrhagic, and undergoes hypertrophy in some portions and necrosis in others. All this leads eventually to the formation of one, or sometimes more, cavities in the transplant, the walls of which thin out and become attached to the ends of the bones and to the newly-forming capsule and a new joint is slowly formed. It is very similar to a ganglion in the structure of its walls and its mucoid contents. Microscopically, the wall consists of fibrous tissue without any endothelial lining. However, Murphy reports reformation of a synovial lining in the joint of a dog operated on by him in the same manner. Clinically, the use of pedunculated flaps has been much oftener resorted to and has given the most satisfactory results."

## DISCUSSION.

**DR. PAINTER.** The subject of arthroplasty of the small articulations of the hand is one that has interested me a good deal, and a thing I want especially to inquire of Dr. Lord is whether he thinks the method of arthroplasty gives better results than the operation for hallux valgus. Of course I realize that where both articular surfaces are destroyed, then it is necessary to insert something, and in cases in which this has been true, in my experience arthroplasty has not been particularly successful. In cases in which one side of the joint has been covered by cartilage, the operation of removing the articular surfaces that are eroded, leaving the others intact, has given satisfactory results, but arthroplasty in the small phalanges has been more rarely successful than arthroplasty in the large articulations, even though a considerable amount of bone has been removed and satisfactory flaps have been secured. I do not think Dr. Lord stated where he obtained these flaps, but those I have used came from the fat of the hypothenar eminence. You can get good thick flaps of fat and fascia in that region, and it is in a situation where it causes no interference with the manipulation you may wish to carry on in the attempt to secure motion afterward. I had hoped that something more than a betterment of the deformity would result from the introduction of arthroplasty in the pharyngeal articulation, but up to the present I have been disappointed with results obtained. On the other hand, I have been gratified in the number of cases where I have excised the end of one of the bones of the metacarpal phalangeal articulation and have left the other intact.

**DR. SILVER.** It seems to me that the fingers form an ideal location for testing out this operation. It seems to me it should begin there instead of the larger joints, because here we have joints upon which we can operate with local anesthesia. They are small, they are easily accessible for trying the procedure to see what we can obtain. It is not so painful to move them and afterward the patient, it seems to me, is more likely to move them actively than large joints like the knee and hip.

Dr. Lord did not speak of the incision, but I suppose he used two lateral, as they are best adapted. As to the use of free or pedunculated flaps, it seems to me, it should be possible to take these flaps from the surrounding tissue, and I thought it might be feasible to use the tissues directly under the extensor tendon. As to the amount of bone removed, I think a small point to remember is to take as much as possible from the proximal end of the distal phalanx, so as to leave the proximal phalanx as long as possible. Another point that seems to me important is the use of extension. It is very easy to carry out extension on the fingers, and we can carry out motion early and still maintain our extension. For these reasons, it seems to me, the fingers are the ideal location for this operation. First, it can be done under local anesthesia without any risk; second, because of the small size of the joints; third, because the patient will use the joints earlier than the larger ones; fourth, we can maintain extension so much better than in the large joints.

**DR. LORD,** closing discussion. In regard to Dr. Painter's point concerning flaps, this is entirely feasible in the metacarpal phalangeal joints. These joints are simple and easy, as I mentioned in my paper. In these attenuated joints, these hands that have been useless for a long time, the skin is drawn, there is no fat, and the ligaments do not seem to be of a normal thickness. I used what material there was beneath the skin, but it seemed the joints were not properly protected by that thin skin, and those operations were soon abandoned by me for the use of this later method of using the free fat and fascia in a considerable amount taken from the fascia lata of the thigh. All of my flaps are taken

from the thigh. I think perhaps that will answer the question raised by Dr. Silver in regard to the use of material at hand. That is the method preferred by me, and we have used it for a long time in other joints, as the first metatarsal phalanges, and when operating for bunion.

These joints are of an entirely different character. They were partly fused, no synovia and it seemed desirable to get rid of as much bone as possible in order to make a proper receptacle for a sufficient amount of fat and fascia. I had no trouble in those joints that were reasonably straight, but in those flexed, I found when I came to straighten them I had no space left for the graft. In the later cases I did not try to straighten the fingers at once. I allowed the wound to heal and began straightening afterward.

We have conceived the idea of obviating the difficulty in the small ends of the proximal phalanges by splitting them, putting in a wedge of bone and burying it so there will be less tendency to lateral deviation.

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### THE FURTHER APPLICATION OF THE INTRA-ARTICULAR SILK LIGAMENT IN THE FLAIL JOINTS OF POLIOMYELITIS PARALYSIS.

BY BERNARD BARTOW, M.D., BUFFALO, N. Y.

A PROCEDURE intended for limiting motion in the paralytic flail hip by inserting paraffined silk strands in the joint, has twice been employed by the writer in total paralysis of the limb. The plan in its main features is similar to that which has been described\* and used in the knee and shoulder joints, but has only recently been adapted to the hip. A few changes in technic have been necessary, owing to the deep position, and ball and socket formation in the hip. Because of the former, the joint cannot be conveniently reached except by raising a flap on its lateral and posterior aspect. The acetabulum has a sufficiently strong and thick portion of bony wall suited to the insertion of silk strands only in the part designated the body of the ilium. The exposure of that region of the bone, behind the origin of the reflected tendon of the rectus femoris, is especially sought when uncovering the joint.

A tunnel through that part of the ilium extending into the joint is made with a curved drill; in its further progress the drill passes through the head of the femur, emerging posteriorly near its junction with the neck. The capsular ligament is not incised, the drill being pushed through its tissues a short distance, to permit a wire leader to be inserted in its "eye" and pulled into the tunnel. A double strand of

\* *AMER. JOUR. OF ORTH. SURG.*, 1912.  
*N. Y. Med. Jour.*, May, 1913.

No. 6 or 8 paraffined silk is next drawn through by means of the leader and the ends strongly tied on the surface of the exposed capsule. Two sets of strands have been inserted in this manner in each case that has been operated. Attention to thigh posture should be given when tying the silk, as rotation outward or inward may be affected by its tension.

Motion in the joint is at once restricted in all directions by the silk fastening. The flap having been stitched into place, the joint is immobilized by a plaster of Paris cast, which the patient should wear for at least three months. Ambulation with the aid of crutches and high shoe may be allowed in older patients as soon as operative discomfort has abated.

Owing to the large curve in the drill, and the direction it must take, some difficulty attends forcing the awl-shaped instrument through the body of the ilium and head of the femur. In its "blind" progress through these bones, it is not easily under control as to its point of emergence from the femoral head. Experience thus far indicates that greater accuracy and facility can be secured by first disarticulating the head of the femur, and drilling each bone, with exposure of the parts. This should add practically nothing to the operative risk, and would probably furnish a little additional surgical trauma,—an important factor in furnishing exudates in sufficient amount to make the limiting process more resistant. In children, three or four years of age, it is probable that excess of cartilage in the hip joint is an obstacle to obtaining a firm bearing for the silk in bony tissue, by the "blind" method of insertion. In patients of that age, unless the head of the femur is first disarticulated, one cannot feel secure on this point.

One patient, four years of age, with a post-operative interval of six months, now has relapse of motion, although firm restraint, by the silk alone, was observed immediately after the operation. In the other case operated on,—a boy aged seven years,—a firm bearing for the strands, and stability were obtained by this plan. Six months after operation (the date when last examined), there was loss of only a small amount of the limitation present when the cast was discarded. Thigh motion, in flexion was approximately 25 degrees, in abduction and adduction less than 15 degrees, and in rotation about one-fourth the normal range. Limiting operations had been done in the knee and ankle of this patient prior to that done in the hip. Six months from the latter event he could bear his entire weight on the limb when standing, walk a short distance unassisted, and, with the aid of one crutch, could walk one-eighth of a mile without much fatigue.

The ease with which this procedure was carried through, compared,

*e.g.* with arthrodesis in the hip joint, was noticeably favorable to the use of the silk insert. By opening the capsule and disarticulating the head of the bone, as suggested, the detail will undoubtedly be facilitated, and liability to relapse of motion diminished\*. The time is too short and the number of cases too small for estimating its full surgical value; but by comparison with some of the commonly observed effects of arthrodesis in the hip, viz., painful limitation, frequent relapse of motion in young children, and the necessary mutilation of the joint, there appears to be a large margin of advantage in favor of the silk insert. There is the further advantage that it may be used much earlier than would be suitable for arthrodesis.

#### GENU RECURVATUM.

The comparative infrequency of residual paralysis in the flexors of the leg, has afforded small opportunity for using intra-silk limitation in the knee for genu recurvatum. In the few instances that have been seen, control of disability has been satisfactorily secured by inserting silk strands in the knee, posteriorly—their location being nearly the reverse of that adopted for the more common “drop leg” condition.

A curved drill is used to penetrate each femoral condyle posteriorly, entering the bone on its superior surface in a line with the epicondyles. Its direction should cause it to emerge on the articular surface of the corresponding condyle, a little back of its centre. The leg is flexed about 30 degrees, and the drill then pushed into the posterior part of the articulating surface on the tibia, and backward through the tibial tuberosity. It should emerge external to the attachment of semi-membranosus tendon on the inner side of the knee, and near the articulation with the fibula on the outer side. Careful blunt dissection, to separate the hamstring tendons, prevents injury of nerves or vessels. Between the points of entrance and exit of the drill, the soft tissues are tunneled close to the bones and capsule of the joint; the silk, after insertion through the bones and capsule, is tied while the leg is slightly flexed. After dressing, the knee is fixed in this position by the plaster of Paris cast.

Tense bands of strong (No. 10) silk, placed in this manner, through the joint and around the ends of the bones, act at first as check ligaments to restrain extension, beyond the angle indicated. Protection in that position is maintained for three or four months by casts. In the meantime, the patient is allowed to walk with crutches as soon as he feels inclined.

\* Since this paper was read the writer has practised disarticulating the femoral head in this procedure.



After removal of the cast and freedom given to use the limb without protection, the flexed knee posture gradually yields, the limb becoming nearly straight. At that point, however, stability usually becomes established with but little tendency to relapse into hyperextension. Replacing the cast, with the knee moderately flexed, counteracts it when threatened.

#### OUTWARD ROTATION OF THE THIGH.

An additional adaptation of the silk insert may also be briefly mentioned at this time, although it belongs to the method by which passive malposture is controlled by *extra-articular* silk fastenings, without intruding on the joint. It has been used to correct passive outward rotation in the thigh, commonly seen when paralysis has occurred before, or soon after, acquiring locomotion,—the patient having occupied recumbent and sitting postures for prolonged periods. It is also seen in some children, whose muscles controlling inward rotation, have been weakened by faulty use of the limb, in addition to the impairment inflicted by the primary disease.

The plan proposes holding the limb in inward rotation, by fastening several strands of No. 4 paraffined silk at a single point in the crest of the ilium, near the anterior superior spine, then carrying them separately downward and outward, in fan shape, under the tensor femoris muscle, and inserting them in the border of the great trochanter, while the thigh is held in strong inward rotation. A small incision is made just below the iliac crest, one inch behind the anterior superior spine, and the silk strands strongly fastened in the external lip of the crest. A second incision is made over the trochanter, where the gluteus maximus glides upon it,—the edge of the muscle being turned aside. With a blunted silk-inserting drill three or four channels are tunneled under the tensor femoris muscle and fascia, one-half inch apart at the trochanter, and converging to the point of insertion of the strands in the iliac crest. A single strand is threaded in the eye of the drill as each tunnel is completed, and pulled under the muscle to the trochanter. All are fastened in the trochanter with uniform tension, the small intervening spaces giving a broad base, like the ribs of an opened fan. Overcorrection of inward rotation is primarily important to offset partial loss in posture due to the weight of the limb. The posture eventually established is effective for assisting locomotion in patients able to walk, and for preventing bad posture in those compelled to remain long inactive, pending the development of some form of locomotion.

## A CASE OF ARRESTED DEVELOPMENT OF THE CARPUS AND TARSUS.

BY JAMES K. YOUNG, M.D., PHILADELPHIA.

**ARRESTED** development of both carpus and tarsus as a cause of deformity is so exceedingly rare as to be worthy of record.

**RELATIVE FREQUENCY.**—For many years the writer has been interested in the subject of congenital absence of parts, especially of the tibia, as a cause of club-foot, and has made two important contributions upon this subject.\* During all this period he has never met with a deformity of bilateral club-foot and club-hand from arrested development or from congenital absence, and so far as he has searched available literature on the subject he has not found one recorded case.

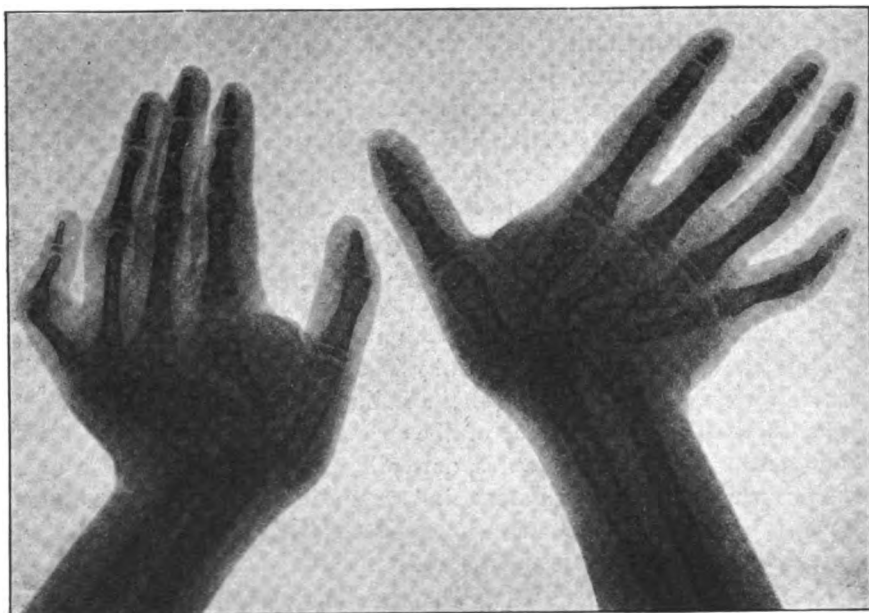
**FAMILY HISTORY.**—There are no other deformities in the family and no history of tuberculosis. There are five children, aged 17, 15, 10 (patient), 8 and 5 years, and all in good health. One child died of pneumonia when 11-2 years of age.

**HISTORY OF THE CASE.**—A Hebrew girl, 10 years of age, came under observation suffering from double club-hand and double club-foot. Her birth was normal and she was apparently a healthy child until one year old, when she had a scrofulous rash over the hands and feet, at which time she developed club-hand, and after she began to walk she developed club-foot. Physical examination was negative. The intelligence is normal and teeth perfect. Examination of the blood was negative, as was also the tuberculin test and Wassermann reaction. The right elbow is limited in extension, but the olecranon is present; the hands are abducted at the wrists. The movements of the wrist joints are free, as are also the movements of the hands and fingers. There is a rash still present over the wrists and extending up the arm, scaly in character and pink in color, which has been present since the first attack. The X-ray examination showed an arrested development of some of the bones in the wrists and ankles. In the wrists the os magnum appears to be present, as is also the proximal extremity of the thumb, but the proximal extremities of the second to the fifth metatarsal bones, inclusive, are absent, as well as the distal epiphysis of the radius and ulna. The centre for the lower extremity of the radius should appear at the fourth year, so that the interference of the growth extends from this period. The carpus has a single centre normally laid down for each bone in the following order: os magnum, first year; unciform, first year; cuneiform, third year; trapezium and semi-lunar, fifth year; scaphoid, sixth year; trapezoid, eighth year; pisiform, twelfth year.

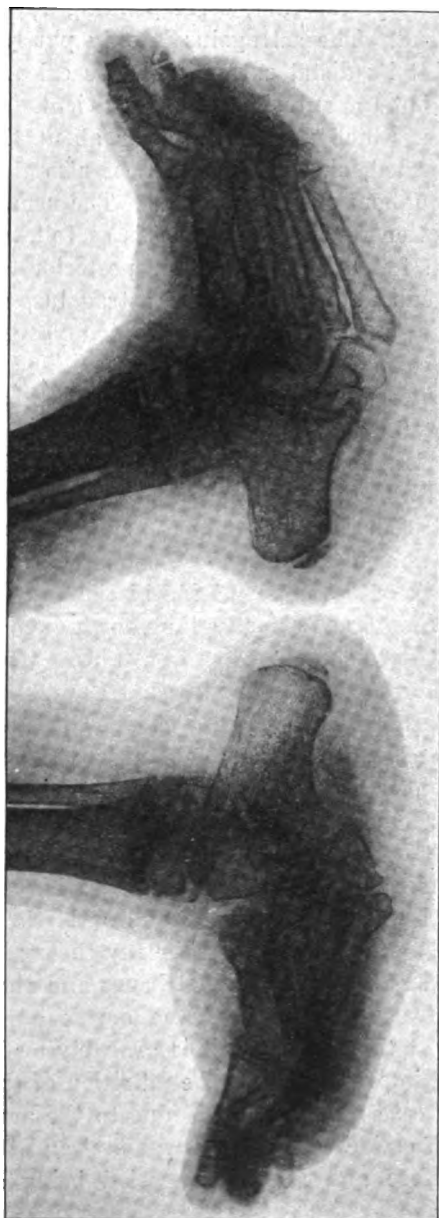
\* *Am. Jour. Med. Sci.*, 1889, Vol. xcv, p. 145; *Univ. Penn. Med. Bull.*, Nov., 1904.



**FIG. 1.**  
Bilateral club-hand and club-foot, from  
arrest of development.



**FIG. 2.**  
Roentgenogram of club-hands.



**FIG. 3.**  
Roentgenogram of club-feet.

In the lower extremity, the proximal extremities of all the metatarsal bones are defective except the first, corresponding very closely to the condition on the hand. The astragalus is only partly formed, being displaced downward at its distal extremity. The calcaneum is formed in its posterior part, but the anterior part is deficient. The cuboid and the middle cuneiform, which normally appear about the fourth year, are present but deformed, showing in the foot also that the arrested growth extended throughout the same period. The usual appearance of the centres of ossification for the tarsal bones is as follows: one for body of the os calcis, sixth foetal month; one for posterior extremity, tenth year; one each for cuboid, ninth month; astragalus, seventh month; scaphoid, fourth year; internal cuneiform, third year; middle cuneiform, fourth year; external cuneiform, first year. The development of the os calcis is very interesting. The first centre for this bone makes its normal appearance at the sixth month of foetal life, being well-formed, but the anterior portion appears to have been arrested in its growth. The second centre, which normally appears at the tenth year and unites at puberty, is normal. The knowledge of the time of the appearance of the centres of ossification in the tarsus and carpus is necessary in order to understand the lack of development in this instance. The presence of all the centres which are normally laid down later show that the cause of the arrested development, whatever it was, was afterward removed, and that the normal bone growth was afterward resumed.

**THE ETIOLOGY.**—Before considering the cause of this arrested growth, one has to consider also the pre-natal, as well as the post-natal causes, and one naturally thinks of heredity, pre-natal disease or arrested development, as well as some acute illness or infection which might cause an arrested development after birth. The first three may be disposed of readily as there is no history of heredity, no history of pre-natal disease, and the child was apparently normal at birth. The arrest of development cannot be accounted for by the ray theory, since the shafts and distal epiphyses of all the metacarpal bones and the phalanges are well formed. The exact character of the arrest of development is difficult to ascertain at this time, but it is probably an infection which produced a profound impression upon the nutrition of the child.

**CONCLUSION.**—The case reported is one due to the arrest of development of the centres of ossification between the first and fourth years, the centres deposited before and after this period being apparently unaffected.

The arrest of development was probably some acute infection, general in character, but its exact nature is unknown.

## OBITUARY

### WISNER ROBINSON TOWNSEND.

THE unexpected death by accident on March 12 of DR. WISNER ROBINSON TOWNSEND of New York brings to a close a life devoted to orthopedic surgery. To nearly all the members of the American Orthopedic Association the loss is personal, for he numbered them among his friends. To the profession in his state and in the country the loss will be unusually felt, since his counsel was widely sought and the responsibilities which he accepted extended far outside his specialty.

One of the surest indications of a warm-hearted nature is the attitude of a man to those who are younger than he. Dr. Townsend was peculiarly the friend and adviser of younger men. Quick to detect sham, ready to appreciate honest endeavor, men turned to him and found him neither too occupied to listen nor too critical to help. His genial manner and essential good humor again and again smoothed ruffled waters and made possible the solution of problems without rancor.

In the meetings of the Association he will be very genuinely missed, not only on account of his very wide experience, which lent a judicial character to his papers and discussions, but also on account of his happy disposition, which accompanied strength and prevented restraint from chafing.

He was born at Staten Island on August 5, 1856. He received his A.B. at Columbia University in 1877 and an A.M. in 1880. Graduating from the College of Physicians and Surgeons in 1880, he entered the practice of medicine in New York, and in 1889 was elected a member of the American Orthopedic Association.

He served as a member of the Publication Committee in 1892, the Membership Committee in 1896 and 1897, was its second vice-president in 1896, and its first vice-president in 1897, and its president in 1898. From 1901 to 1908 he was a member of the Executive Committee of the American Congress of Physicians and Surgeons, and for twelve years was secretary of the Trustees of the Medical Society of the State of New York. He had also a long official connection with the American Medical Association, and at the time of his death was a Trustee of the New York Academy of Medicine.

A few years ago he resigned from the Professorship of Orthopedic Surgery at the New York Polyclinic Medical School, but retained his position as Associate Surgeon to the Hospital for Ruptured and Crippled, with which institution he had been connected since 1890.

His contributions to medical literature were many and varied. Twelve important papers were presented to the American Orthopedic Association between 1889 and 1912: A Case of Osteitis of the Head of the Femur, Vol. IX, p. 162; Acute Arthritis of Infants, Vol. II, p. 260; An Unusual Deformity Following Operation for Knock Knee, Vol. XII, p. 135; Excision of the Hip, Vol. X, p. 66; Tendon Transplantations in Treatment of Deformities of the Hand, Vol. XIII, p. 193; The Abuse of Flat Foot Supports, Vol. XVI, p. 71; The Necessity for Early Orthopedic Treatment in Poliomyelitis, Vol. XXI, p. 91; The Necessity for Mechanical Treatment after Operations for Club Foot, Vol. V, p. 216; The Treatment of Abscesses of Pott's Disease, Vol. IV, p. 265; The Treatment of Paralytic Club Foot by Arthrodesis, Vol. XVIII, p. 378; Tubercular Disease of the Shoulder Joint, Vol. VII, p. 187; Uniform Nomenclature in Orthopedic Surgery, Vol. IV, p. 13.

Dr. Townsend's career made the practice of medicine a more attractive profession and added to the respect in which orthopedic surgery is held. As one of his closest friends has said, "He was one of the 'old guard,' a loyal friend and a valiant fighter."

# Orthopedic Society Meetings

AMERICAN ORTHOPEDIC ASSOCIATION.

PRELIMINARY ANNOUNCEMENT OF THE THIRTY-NINTH ANNUAL SESSION, TO BE HELD  
AT WASHINGTON, D. C., IN CONJUNCTION WITH THE CONGRESS OF  
PHYSICIANS AND SURGEONS

MAY 8-11, 1916.

Headquarters for the Association will be the New Willard Hotel.  
Local Committee of Arrangements: Dr. John Dunlop, Dr. Shands, and Dr.  
Erving. Members and guests are advised to communicate with Dr. John Dunlop,  
1621 Connecticut Avenue, Washington, D. C., in regard to hotel accommodations.

MONDAY, MAY 8TH.  
CLINICAL DAY. OPERATIVE CLINICS.

Place to be named on Official Program.  
10 A.M. Operations by:  
DR. FRED ALBEE. "Bone Graft."  
DR. W. E. GALLIE. "Tendon Implantation."  
DR. J. W. SEVER. "Obstetrical Paralysis."  
DR. W. W. PLUMMER. "Intra-articular Ligaments."  
DR. R. SOUTTER. "Silk Ligaments."  
DR. W. S. BAER. "Arthroplasty."

This Clinic is dependent upon the finding of suitable cases for operation.  
Other clinical demonstrations will be made by the Washington members.

TUESDAY, MAY 9TH.

9.00 A.M. First Scientific Session.  
DR. CHARLES F. PAINTER, President's Address.

"Symposium on Infantile Paralysis."  
9.20-9.50. DR. SIMON FLEXNER. "Prevention of Epidemic Infantile Paralysis."  
9.50-11.30.  
DR. MARK H. ROGERS, Boston.  
DR. F. W. RYERSON, Chicago.  
DR. G. G. DAVIS, Philadelphia.  
DR. R. T. TAYLOR, Baltimore.  
DR. CHARLTON WALLACE, New York.

"Treatment of Infantile Paralysis."  
These papers will to some extent reflect the consensus of experience in the  
communities represented.

11.30-12. Discussion to be opened by the following:  
DR. BRACKETT, DR. WILSON, DR. H. L. TAYLOR, DR. RIDLON, DR. ALLISON,  
*et als.*

12.00-1.00. Executive Session.

2.30 P.M. Session of Congress of Physicians and Surgeons.

Subject: "Syphilis." Papers as follows:

DR. JOHN A. FORDYCE. "The Diagnosis and General Treatment of Syphilis."

DR. HOMER F. SWIFT. "The Treatment of Cerebrospinal Syphilis."

DR. HUGH CABOT. "Syphilis and Society."

Discussion. DR. ISADORE DYER, DR. HUGH T. PATRICK, DR. WILLIAM G. SPILLER.

8.00 P.M. DR. WILLIAM S. THAYER. Address of President of the Congress.

8.30-10.00 P.M. Evening Session after President's Reception. This time may be changed to the late afternoon, if it seems more practicable. (Continuation of First Scientific Session.)

DR. J. W. SEVER. "Obstetrical Paralysis." (Lantern.)

DR. J. SPELLISSY. "Standardized System of Metrical Photographic and Radiographic Records." (Lantern.)

DR. ARTHUR STEINDLER. (Thesis.) "Problem of Direct Implantation of Nerves Into Paralyzed Muscles."

DR. H. L. TAYLOR. "Standardization of Conditions Affecting Posture."

DR. J. E. GOLDTHWAIT. "The Opportunity for the Orthopedist in Educational Work in Posture as a Preventive Medical Measure."

#### WEDNESDAY, MAY 10TH.

9.00 A.M. Second Scientific Session.

"Symposium on Visceroptosis as a Factor in the Causation of Orthopedic and Other Lesions."

DR. SULLIVAN, Boston. Anatomical viewpoint.

DR. SILVER, Pittsburg. Orthopedic viewpoint.

DR. BETTMAN, Cincinnati. Internist's viewpoint.

DR. BAETJER, Baltimore. Radiographer's viewpoint.

DR. OSGOOD, Boston. Orthopedic viewpoint.

11.30-12.00. Discussion.

DR. J. E. GOLDTHWAIT, DR. COFFEY, DR. FREIBURG, *et als*.

3.00 P.M. Session of Congress of Physicians and Surgeons.

Subject: "Immunization and Its Practical Applications." Papers as follows:

DR. THEOBALD SMITH. "The Underlying Problems of Immunization."

DR. LUDWIG HEKTOEN. "Vaccine Therapy."

DR. WILLIAM H. PARK. "Serum Therapy."

Discussion. DR. FRANK BILLINGS, DR. RUFUS I. COLE, DR. THOMAS W. HASTINGS, DR. THEODORE C. JANEWAY.

Possible short, late afternoon session after meeting of the Congress.

#### THURSDAY, MAY 11TH.

9.00 A.M. Third Scientific Session.

DR. N. ALLISON. "Experimental Work on Bone Tuberculosis."

DR. C. H. BUCHOLZ. "Nerve Transplantation (partial) in Spastic Paralysis."

DR. W. E. GALLIE. "The Use of Boiled Bone as a Spinal Support in Pott's Disease."

DR. J. J. NUTT. "Preliminary Clinical Report on the Mobilization of Fibrous Ankylosed Joints by Means of Radium."

DR. A. T. LEGG, and DR. F. OBER. "Clinical Comparison Between Acetabular and Femoral Tuberculosis."



DR. J. SPILLISSY. "Probable Etiology of Indeterminable Scoliosis."

DR. JOHN RIDLON. "An Appreciation of Jean Pierre David—The Man Who Potted Pott."

DR. E. G. ABBOTT. "A Report on Some Cases of Scoliosis."

DR. H. M. SHERMAN. "Focal Infection and Joint Conditions."

12.00-1.00. Second Executive Session.

2.00 P.M. Fourth Scientific Session.

DR. M. S. HENDERSON, Rochester, Minn. (Thesis) "Intraperitoneal Inoculation of Animals; Its Value to Orthopedic Surgery."

DR. Z. B. ADAMS. "An Anatomical Study of the Ligaments of the Lumbo-Sacral Region."

DR. H. L. PRINCE, Rochester, N. Y. (Thesis) "Giant-Celled Tumor of Os Calcis."

DR. P. W. ROBERTS, New York City. (Thesis) "The Influence of the Os Calcis on the Production and Correction of Valgus Deformities of the Foot."

DR. DEFOREST P. WILLARD, Philadelphia. (Thesis) "Subastragalar Arthrodesis in Lateral Deformities of Paralytic Feet."

DR. R. H. SAYRE. "Remarks Upon the Occurrence of Rickets in Adolescents and Adults."

DR. S. TWINCH. "The Treatment of Tuberculous Bone and Joint Diseases with Tuberculin. A Report of Fifty Consecutive Cases."

The following papers and reports of cases will be reserved to fill in the late afternoon session of Wednesday, May 10th, if such is decided upon, or to take the place of any papers on the above program which for any reason are not presented by the authors.

It is urgently requested that in each and every case where a paper has been offered, whether it shall have been read or not, the manuscript, or a copy of it, be given to the Secretary before the adjournment of the meeting.

DR. F. E. PECKHAM. "Scoliosis." (Lantern.)

DR. B. H. WHITEBECK. "Report of Cases of Fracture of Neck of the Femur."

DR. P. LEBRETON. "Report of a Case of Fracture of the Odontoid Process."

DR. A. T. LEGG. "Atrophy of the Femoral Epiphysis." (Experimental Study.)

DR. R. O. MEISENBACH. "A Rustless and Stainless Steel for Orthopedic Apparatus."

DR. M. H. ROGERS. "An Operation for the Correction of Deformity Following Birth Palsy; Results in Three Cases."

DR. R. E. SOULE. "The Use of the Autogenous Bone-Graft Pin in the Treatment of Painful Flat Foot."

DR. W. W. PLUMMER. "An Unusual Case of Spinal Cord Tumor with Operation Findings and Specimens."

DR. J. T. RUGH. "Atlo-Axoid Disease; Report of Two Cases."

DR. J. T. RUGH. "Report of Cases of Xiphopagi with Findings at Operation for Their Separation."

DR. R. H. SAYRE. "Case of Double Congenital Malposition of the Superior Radio-Ulnar Articulation Impeding Flexion of the Forearm."

DR. G. W. HAWLEY. "Exhibition of Apparatus: Actual Apparatus and Slides of Same."

DR. J. ARCHER O'REILLY. "Spastic Paralysis."

DR. ROBERT SOUTTER.

1. "Technique of Fasciotomy at the Hip and Its Application to Infantile Paralysis and Other Conditions."

2. "The Value of Astragalectomy with Displacement of the Foot Backward,—Dr. Whitman's Operation."
  3. "A Case of Double Congenital Absence of the Tibia Bone Transplanted from the Sister."
- DR. J. P. LORD. "An Operation for Advancement of the External Malleolus in Extreme Equino Varus Paralyticus."
- DR. ROLAND HAMMOND. "Certain Aspects of Injuries of the Lower Spine."
- DR. M. H. ROGERS. "A Study of 75 Cases of Tuberculosis of the Spine in Adults."
- DR. G. R. ELLIOTT. "The Necessity of a Correct Diagnosis in Different Types of Infantile Paralysis Before Operative Procedures Are Instituted; Damage Resulting Through Mistaken Diagnosis." Illustrated by certain types as: 1. The different types of Myotonias. 2. The so-called Wilson's Disease. (Illustrated by lantern slides.)
- DR. R. T. TAYLOR. "Shortening Long Legs and Lengthening Short Legs: A New Surgical Procedure."
- DR. J. K. YOUNG. "The Roentgen Diagnosis of Lumbo-sacral Lesions."
- DR. C. H. BUCHOLZ. "The Early Functional Treatment of Fractures."
- DR. FRED H. ALBEE. "A Demonstration of the Value of Moving Pictures in Teaching Surgical Bone Technique."

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BOSTON ORTHOPEDIC CLUB.

MARCH 20, 1916.

- Speakers:—DR. ROBERT B. OSGOOD. "Opportunities for Orthopedic Work Presented by the European War."
- DR. EBBEN FISKE. "Orthopedic Surgery in an English Base Hospital."

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INTERURBAN ORTHOPEDIC CLUB, APRIL 7 AND 8  
NEW YORK CITY.

FRIDAY, APRIL 7.

ROCKEFELLER INSTITUTE.

- 9-10 DR. SIMON FLEXNER, DR. H. NOGUCHI, DR. AMOSS. "Studies on Infantile Paralysis" (illustrated with lantern slides).

NEW YORK ORTHOPEDIC HOSPITAL.

- 10.00 DR. R. A. HIBBS. "Operation for Pott's Disease."
- 10.35 DR. B. P. FARRELL. "Cases of Tubercular Knee Joint Disease upon Which an Operation Has Been Done to Eliminate Motion."
- 10.50 DR. H. A. DURHAM. "Cases of Tendon Transplantations, Arthrodesis, Silk Inserts, etc., for the Corrections of Deformities of Infantile Paralysis."
- 11.10 DR. T. H. MYERS. "Exhibition of Cases of Congenital Dislocation of the Hip, Operated upon for Correction of Anteversion."
- 11.20 DR. R. A. HIBBS. "Exhibition of Cases of Pott's Disease after Operation."
- 11.35 DR. R. G. MOORE. "Exhibition of Spinal Specimens."
- 11.45 DR. MACINTYRE. "Cases of Fracture of the Spine and Laminectomy."
- 11.55 DR. R. E. HUMPHRIES. "Muscle-Bound Feet."
- 12.05 Inspection of Hospital with DR. R. A. HIBBS.

## NEW YORK POST-GRADUATE HOSPITAL.

- 2.00 DR. W. J. MACNEAL. "Review of Pellagra Investigation."
- 2.30 DR. J. B. SQUIER. "Educational Value of Moving Pictures."
- 2.45 DR. F. H. ALBEE. "Moving Pictures Demonstrating: Bone Graft Operation for (a) Pott's Disease, (b) for Fracture of the Neck of the Femur, (c) for Tubercular Knee."
- 3.30 DR. F. H. ALBEE. "Demonstration of Final Results in Bone Grafting Operation."
- 4.00 DR. J. J. MOORHEAD. "Experiences in Fracture of the Femur."
- 4.15 DR. C. OGILVY. "The Operative Treatment of Weak Feet in Children" (with demonstration of cases).
- 4.35 DR. H. L. TAYLOR. "Work of the American Posture League" (illustrated with lantern slides.)

SATURDAY, APRIL 8.

## HOSPITAL FOR THE RUPTURED AND CRIPPLED.

- 9.00 DR. WM. SHARPE. "Cranial Operation for Selected Case of Cerebral Spastic Paralysis."
- 9.30 DR. V. P. GIBNEY. "Osteochondrofibroma."
- 9.45 DR. R. WHITMAN. "A Method of Treatment for Fixed Rotary Lateral Curvature" (with demonstration of cases).
- 10.00 DRS. H. L. TAYLOR and WM. FRIEDER. "Quiet Hip Disease" (illustrated with lantern slides).
- 10.15 DR. P. W. ROBERTS. "Influence of the Os Calcis on Valgus Deformities of the Foot."
- 10.30 DR. GEORGE HAWLEY. "Recent Advances in Fracture Work."
- 10.45 DR. GEORGE BARRIE. "Hemorrhagic Osteomyelitis" (illustrated with lantern slides.)
- 11.00 DR. WALTER TRUSLOW. "Scoliosis—Combined Gymnastic and Brace Treatment."
- 11.30 DR. CHARLTON WALLACE. "Pituitary Treatment of Polyarthritis."

## HOSPITAL FOR DEFORMITIES AND JOINT DISEASES.

- 2.00 DR. H. W. FRAUENTHAL and staff. Inspection of Hospital with demonstration of interesting cases.

## MONTEFIORE HOME.

- 3.15 DR. G. R. ELLIOTT and staff. Inspection of New Building. "Demonstration of Interesting Chronic Joint Lesions":
  - 1. "Cases of Myatonia from the Orthopedic Standpoint."
  - 2. "Some Unusual Types of Chronic Multiple Arthritis."
  - 3. "Patients Illustrating Certain Types of Rigid Spine."
  - 4. "Pathological Specimens From a Case of Ochronosis with Melanuria and Spondylitis."
  - 5. "X-ray Plates Illustrating Some Striking Forms of Bone Metastasis in Carcinoma."

## Correspondence

### CONCERNING THE NON-OPERATIVE TREATMENT OF SUBACROMIAL BURSITIS AND CALCAREOUS SPINATUS TENDINITIS: A CORRECTION.

To the Editor, AMERICAN JOURNAL OF ORTHOPEDIC SURGERY:

In his "Report of a Case of Deposit in the Supraspinatus Muscle Simulating Subacromial Bursitis" in this JOURNAL, February, 1916, Dr. John Dunlop of Washington speaks of "Dr. Brickner's positive statement that all such cases should be operated and all deposits removed."

In the papers he referred to I said: "I shall not here describe the non-operative treatment nor, in detail, the indications for operation. In acute cases, if there are severe and increasing pain and loss of function and a radiograph shows lime formation, open operation affords the promptest relief; indeed, if I may generalize from two cases, it speedily aborts a condition that would otherwise be very prolonged. In less severe acute cases, without evidence of tendon injury, treatment by rest, preferably in bed, with the arm abducted,<sup>1</sup> should be given a full trial. In long-standing cases much can often be done by persistent conservative measures; but none of my cases with lime deposits has been relieved of pain except those operated upon. If the pain and loss of function seriously interfere with sleep and work, if the muscles are undergoing atrophy, and especially, if there is a deposit, operation provides the surest means of early cure,"<sup>2</sup> and, "I have no doubt that some cases with lime deposit become more or less quiescent or even eventually undergo a spontaneous cure; but in my personal experience none of the patients with lime deposits has been relieved of pain by any method except those operated upon."<sup>3</sup>

Since these articles were written, I have effected recoveries in other cases, some by operation and some by the simple automatic abduction method which I have elsewhere described.<sup>4</sup>

WALTER M. BRICKNER, M.D., F.A.C.S.

#### REFERENCES.

<sup>1</sup> A Simple Easily Regulable Method of Applying Abduction in the Treatment of Shoulder Disability. *Medical Record*, January 2, 1915.

<sup>2</sup> Prevalent Fallacies Concerning Subacromial Bursitis: Its Pathogenics and Rational Operative Treatment. *American Journal of the Medical Sciences*, March, 1915.

<sup>3</sup> Shoulder Disability: A Further Study of Its Varieties and Their Treatment. *Interstate Medical Journal*, April, 1915.

## Book Reviews

*Gunshot Injuries of Bones.* By ERNEST W. HEY GROVES. Oxford University Press, 1915.

In this number of the Oxford War Primers certain general principles regarding bone injuries are set forth in broad outline. One quarter of the book is given up to pathology, physiology, diagnosis, symptoms and repair. The rest is devoted to treatment. Injuries of the skull, vertebrae, carpus and tarsus are not discussed, as they are dealt with in another primer.

## Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.
- X. War Surgery.

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### V. SCOLIOSIS AND STATIC DISTURBANCES.

IMPORTANCE OF X-RAY PICTURES IN THE EXAMINATION OF THE PRONATED FLAT FOOT. Badin. *Annales de Chir., et d'Orthop.* XXVI, No. 8, p. 243.

Badin emphasizes the use of the X-ray picture for the examination of the pronated flat foot. While the normal foot shows on the X-ray plate no distinct differences without weight bearing, in the flat foot those differences become very striking in the lateral as well as in the dorso-plantar view. The head of the astragalus is much inclined downward and the whole astragalus is moved forward, the os calcis backward. The change of position of the astragalus indicates the amount of valgus, the flattening of the anterior part of the os calcis indicates the flat foot deformity. The practical conclusions are as follows: one must try to push the os calcis upward and forward and the head of the astragalus outward and backward. The author tries to accomplish this by appropriate changing of the shoe, which should be individually fitted.—C. H. Bucholz, Boston.

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ABBOTT'S METHOD OF TREATMENT OF LATERAL CURVATURE. Bilhaut sen. *Annales de Chir. et d'Orthop.* XXVI, p. 321.

Bilhaut is not inclined to agree with the enthusiastic admirers of Abbott's method. The old methods have furnished good results without involving such a grave danger, as is proved by the fact that two patients have died from Abbott's method. Furthermore, he disputes the originality of Abbott's idea and calls attention to Hoffa's and his own method. Both these authors have used flexion to correct scoliosis. The important point is to treat the cases as early as possible with corrective measures.—C. H. Bucholz, Boston.

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PAINFUL FEET. CAUSES AND TREATMENT. Henry W. Frauenthal. *J. A. M. A.*, Nov. 27, 1915. p. 1897.

Many cases of foot infection are secondary to infection elsewhere in the body. Several cases are cited to illustrate painful feet due to pyorrhœa, non-gonorrhœal leucorrhœa, syphilis, gout, obliterating endosteitis and gonorrhœal infections. A plea is made for treating these causes, as well as the symptoms. Rigid foot plates are not used.—Edward S. Hatch, New Orleans.

**HYPERTONICITY OF THE CALF MUSCLES AS A CAUSE OF PAIN IN THE FEET AND INABILITY FOR FIELD SERVICE.** K. Hasebroek. *Münch. med. Woch.*, June 20, 1915.

There is often a congenital predisposition to hypertonicity of the leg and foot muscles, which disables a soldier for active field duty, on account of excessive pain in the foot while walking. Massage and instep braces are usually sufficient to relieve the pain of this condition.—*Walter G. Stern, Cleveland, Ohio.*

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**OPERATIVE TREATMENT OF BUNIONS BY THE MAYO METHOD.** Melvin S. Henderson. *Jour. A. M. A.*, Oct. 16, 1915, p. 1356.

The author states that the Mayo operation for bunion is for the bursitis, and not, primarily, for the deformity of hallux valgus, which, without mechanical or infectious inflammation of the bursa, is often not troublesome. He believes the condition to be largely caused by short shoes. The operation consists of the removal of the greater portion of the head of the first metatarsal bone, having first dissected back the bursa on a flap, with its base forward, which is later tucked in between the metatarsal and the proximal phalanx. No splint is used, a pad of gauze between the first and second toes, and avoidance of the weight of the bed-clothes, being considered sufficient. The article is well illustrated and concisely written, although it might have been more complete if the end results had been considered.—*Eben W. Fiske, Boston.*

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**A NEW METHOD OF TREATING FLAT FOOT.** Perez B. Howard. *Boston Med. and Surg. Journal*, Sept. 16, 1915, p. 433.

Howard has devised an air cushion arch support, which may be raised or lowered by inflating or deflating with air. There is no definite statement in the article as to whether or not it is to be used for all types of foot conditions termed flat foot.—*Frank R. Ober, Boston.*

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**THE TREATMENT OF RIGID ROTARY LATERAL CURVATURE OF THE SPINE BY A NEW BRACE.** Samuel Kleinberg. *N. Y. State Jour. of Medicine*, September, 1915.

The brace described in this article is the result of much careful study and is skilfully constructed, and, in the hands of Dr. Kleinberg, seems to be very effective.

In this article the author does not profess to cure every case of lateral curvature. He says: "The question has often been raised as to which are, and which are not, favorable cases for treatment, and a review of about 100 patients under observation during the past three years leads me to conclude: firstly, that the limitations are the same for both the Abbott jacket and the writer's brace; and, secondly, that practically no improvement is obtained in the following types of scoliosis:

1. Curvatures with sharp angulation of the ribs, sometimes called 'razor-backs.'
2. High dorsal curves.
3. Cases with marked distortion in the lumbar region.
4. Severe S-shaped curves, with the dorsal deformity equal in extent and degree to the lumbar.
5. Mild deformities with congenital malformation."

In the same study the author found the following types of deformity favorable for treatment:

1. Single curve to the right or left, of mild or moderate degree.
2. Cases with long dorsal and short compensatory lumbar curves.
3. Mild S-shaped curves.
4. Cases with moderate deformity in the lower half of the dorsal region, and very little compensatory deformity above or below this.

The other factors which influence the prognosis, the author says, are:

1. Length of time the deformity has been in existence.
2. Location of the deformity.
3. Degree of severity of the deformity.
4. Type of deformity; single, double or triple curve.
5. Congenital malformation.

Conclusions: From the foregoing facts the author wishes to emphasize that:

1. The treatment of rigid scoliosis is a prolonged one.
2. Improvement can be obtained in the mild and moderately severe types.
3. The brace accomplishes this result as well and as rapidly as the plaster jacket, and with far greater comfort to the patient and less exertion to the surgeon.—*Sidney A. Twinch, Newark, N. J.*

THE ETIOLOGY OF SCOLIOSIS. Charles B. Lewis. *Pedagogical Seminary*, June, 1915.

The author gives a comprehensive review of recent literature, quotes freely from many writers and reaches conclusions which may be summarized as follows:

In accordance with the opinion of the best modern authorities, it is likely, on general principles, that unfavorable school conditions are a competent cause of postural or false scoliosis and of slight grades of true scoliosis, but that they are not the cause of moderate or severe scoliosis.

The average of all observers shows that scoliosis is present in about 27% of all school children, with the greatest frequency between the ages of seven and fourteen years. From an analysis of 9485 school children examined by different and competent observers in various parts of Europe, there were 25 to 30% affected with lateral curvature.

The best European and some American authorities agree that: (1) rachitis is the chief cause of scoliosis and is responsible for more than 50% of the cases; (2) innate abnormalities play an important rôle in the etiology, and may account for from 15 to 20%, leaving about 30% for other causes.

The present state of our knowledge of the etiology is unsatisfactory and vague,—claiming many causes, either primary or contributing. We must look in every direction,—investigate and study the conditions of normal growth and the pathology of growth. More especially should we study the innate or congenital abnormalities and the functioning of the glands of internal secretion.

The author examined 1100 boys, who had entered the High School in Worcester, and found 902 scoliotic cases, of which 66% were of a functional type and 34% of a structural nature. The important etiological factors were rickets, poor posture, poor muscular function and weight-bearing occupations.

No deviation of the spine should be allowed to correct itself; and close observation of children during growth and puberty should be made the rule rather than the exception. A normal child, properly fed and looked after from infancy, will not develop deformities any more than it can get rickets, scurvy, etc. The child's attitude while sitting, standing, walking and sleeping should be observed, and corrected if found faulty.—*Walter G. Elmer, Philadelphia.*

**FOOT STRAINS AND OTHER COMMON FOOT DEFECTS.** Herman W. Marshall. *Boston Med. and Surg. Journ.*, Dec. 30, 1915.

This is an eleven-page article dealing with nearly every phase of the subject and containing numerous illustrative case reports and photographs. Obviously it does not lend itself to being abstracted. Practically all known methods of treatment are mentioned and approved, if applied to the proper type of case or at the proper stage of a given case. The indications for all these procedures, however, are not always clear to the reader, in fact, the applications of them often appear rather empirical or experimental. Great importance is given to the physiologic state of the muscles and other supporting soft tissues depending on blood conditions. Consequently "tonic-eliminative" measures are considered a most valuable part of the treatment.

The matter is grouped under four headings: 1. Simple relaxations and strains. 2. Rigid flat foot and allied conditions. 3. Foot strain accompanying other distinct pathologic states. 4. Miscellaneous lesions, confused or associated with foot strain.

A few of the general conclusions are:

1. Avoid routine use of any single special method.
2. Treat special foot diseases in appropriate special ways.
3. Observe the kind of shoes worn; pathologic signs and symptoms in the feet; amount of use of feet demanded; state of health and its recent changes; past treatments and history; and then proceed gradually to make necessary alterations and prescriptions in a careful manner.
4. Remember that treatments have to be ended skilfully, as well as begun properly, and so discontinue plates, straps, medicines, etc., at best times.
5. Do not exaggerate the importance of easily recognized anatomic defects nor underestimate equal values of obscure physiologic peculiarities. Remember that all patients have vascular systems; that possibilities of blood variation have to be dealt with in all cases, and many times are only ways of attacking physiologic defects; furthermore, that regulations of vascular defects sometimes are simple, although defects themselves are complicated or unknown.—*R. Wallace Billington, Nashville.*

**PAINFUL WEAK FEET: REPORT OF A CASE.** H. Winnett Orr. *J. A. M. A.*, Dec. 25, 1915, p. 2236.

One case is reported in which a tenotomy of the peroneals was successful in relieving very painful feet. This operation, or better, resections of these tendons, after Jones, is advised.—*Edward S. Hatch, New Orleans.*

**AMPUTATION OF GREAT TOE; MUSCULAR PHYSIOLOGY OF LOWER EXTREMITY.** J. C. Schapps. *Medical Record*, Sept. 25, 1915.

Schapps discusses the physiologic action of the large muscles attached to the last phalanx of the great toe in preserving the form and function of the foot, and advises careful anchoring of both tendons to the remaining stump in amputation of that member.

There is an accompanying illustration of a case where this procedure was followed with apparently perfect functioning of the foot some six weeks later.—*C. A. Parker, Chicago.*

**VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.**

**STRUCTURAL CHANGES IN CONGENITAL HIP DISLOCATION.** Wallace Blanchard. *J. A. M. A.*, November 20, 1915.



Roentgenographic studies of a series of congenital hip dislocations seem to warrant the following conclusions:

1. Best functional results in children from ages of three to five.
2. The roentgenographic findings bear a definite relation to the expected result.
3. Cases showing from 2.5 to 4 cm. of shortening give best prognosis.
4. Eight months in plaster, in author's cases reported, seems shortest time sufficient to allow structural changes to take place in the femoral head and the acetabulum.
5. Satisfactory function is to be expected in a large proportion of cases.—*E. Laurence Scott, Birmingham, Ala.*

CONGENITAL HEREDITARY ABSENCE OF SOME OF THE DIGITAL PHALANXES. D. S. Clarke. *British Medical Journal*, August 14, 1915.

The last digits were gone from the same two fingers of each hand. The tips of the affected fingers were rounded off without any indication of a nail. The abnormality was present in several members of the family and seemed to affect the first two born in each family, irrespective of the sex, and is present at birth. The patient, a middle-aged woman, stated that her grandmother was similarly affected, as were also her mother, brother, uncle, and two cousins. In spite of the deformity, the patient had no difficulty in performing the ordinary movements of the hand, but complained of inability to knit. The article is illustrated by drawings in black and white and drawings from radiographs.—*S. A. Twinch, Newark, N. J.*

CONGENITAL CLUB FOOT (VOLKMANN). Froelich. *Revue de Chir.*, XXXIV, No. 7, p. 134.

Froelich presented a child, five years old, with Volkmann's disease of the left foot. The case showed such a pronounced valgus that the dorsum of the foot could be easily placed against the external border of the leg, as is seen in the congenital absence of the fibula.

In the present instance, however, the fibula was present, but situated immediately back of the tibia, so that the astragalus was no longer held in its accustomed mortise.

In a former case Froelich had sectioned the lower end of the fibula and brought it around to its normal position, and thus furnished a support to the unstable astragalus. A similar line of treatment was followed in the present case, with the same satisfactory result.—*W. J. La Marche, Cambridge, Mass.*

CASE OF SUPERNUMERARY TOES. C. G. Havell. *Lancet*, Sept. 18, 1915.

A short report of a case of supernumerary small toes. There was a perfect formation of individual toes. X-ray examination showed a massive construction of the fifth metatarsal articulating with two outermost toes, each of two phalanges. The case presented for surgery that the patient might enlist. Havell declined to operate, calling it "Procrustean."—*E. A. Rich, Tacoma.*

ANTEVERSION OF THE NECK OF THE FEMUR, IN CONNECTION WITH CONGENITAL DISLOCATION OF THE HIP. Russell A. Hibbs. *J. A. M. A.*, Nov. 20, 1915.

Hibbs cites his experience with anteverted femora in congenital dislocation of the hip as a contributing cause of failure in reduction. An osteotomy on the lower third of the femur is done several weeks before reduction is attempted. In his hands the correction of the anteversion by the osteotomy, prior to the reduction, has simplified the procedure, and in the series of

cases reported, has enabled him to obtain more uniform results.—*E. Laurence Scott, Birmingham, Ala.*

CONGENITAL DISLOCATION OF THE HIP. Robert L. Hull. *Journal of the Oklahoma State Med. Assn.*, September, 1915.

Dr. Hull's paper is a very timely one, as it is a plea to medical men in general to be on the alert for these cases. He considers, as is the accepted opinion, that the result in these cases when treated early is very satisfactory; that in single cases one gets improvement, but imperfect results, after the child is seven or eight years old, and the same is true of the double cases after they are six years old. He thinks much harm is done by the medical advisor, who tells the mother that her child will outgrow the painless limp. Where the diagnosis is made early he advises waiting until after the child has passed the napkin stage. He thinks that the open reduction should be reserved for those cases where manipulation has failed after many attempts. He reports four cases in which he has obtained good results.—*C. B. Francisco, Kansas City.*

FOUR CASES OF CONGENITAL FRACTURE OF CLAVICLE. S. M. Johns. *Journal-Lancet*, Oct. 1, 1915.

Four brothers, 24, 17, 14, and 12 years old. Both clavicles fractured in each case, and previously unnoticed, all ununited except one in the oldest and one in the 14-year-old boy. Very little disability, and marked deformity in only two instances. All cases showed evidence of rachitis.

No treatment was used in these cases, but operation was advised. No review of literature.—*E. W. Ryerson, Chicago.*

CERVICAL RIB AS A CAUSE OF BRACHIAL PAIN. Fred B. Kyger. *Jour. A. M. A.*, Oct. 2, 1915, p. 1179.

In this case of cervical rib in a patient aged 21 years, pain had been felt in the right arm and neck for about a year, and growing steadily worse. Examination was negative except for firm resistance to palpation on either side of the neck, with tenderness, but no pulsation, as described by Cabot. Removal gave permanent relief.—*Eben W. Fiske, Boston.*

REPORT OF A CASE OF SPINA BIFIDA. O. H. Rockwell. *Penna. Med. Journal*, September, 1915.

Rockwell reports the following case, which was born in April, 1904, after a prolonged and difficult labor:

The child's body was normal above the pelvis; the pelvis, however, was double, with three legs, the middle and smallest leg being somewhat deformed. There was a single opening behind, anal, in the right pelvis; there were two openings in front, one in each pelvis, the one in the right pelvis being a vaginal opening, with urethra communicating with the bladder, which was single; the other opening in the left pelvis, at first taken for a second vaginal opening, proved to be a second anal opening, although without sphincter muscle. There were fecal discharges from both openings, not always simultaneous, but continuing during her life.

Between the middle and left leg, at the lower end of the sacrum, there was a large fluctuating tumor,—spina bifida,—covered with integument, tense and almost transparent. It was thought from the size of the tumor, which was fully as large as the baby's head, that she would live only a short time. She, however, lived and grew, though never very strong, and never walking, but mentally a very bright and attractive child, until March, 1914 (10 years

of age), after a few days of extreme suffering, due to pressure, the tumor ruptured, discharging large quantities of bloody serum; death followed in about seventy-two hours after the rupture.

Excellent photographs of the case accompany the report.—*Arthur J. Davidson, Philadelphia.*

TREATMENT OF CONGENITAL CLUB FOOT. C. A. Stone. *Jour. of the Missouri State Med. Assn.*, September, 1915.

The paper is based upon an experience with 35 or 40 congenital cases, one of the objects being to call attention to the fact that many doctors are still advising their patients to wait, or even telling them that nothing can be done. The author wishes to emphasize the importance of beginning the treatment early and having the profession realize that the deformity can absolutely be corrected, but that it takes much work over a long period of time, accompanied with a great deal of patience.

His conclusions are as follows: (1) Club feet should be corrected at once, then anesthetics and operation are unnecessary. (2) Older babies need tenotomies before proper correction can be done. (3) Bruising of a resistant foot should be avoided, and even if the child is young, less damage is done by the knife. (4) In older children, with badly deformed feet, tenotomies alone should not be attempted. The removal at once of a wedge of bone will save the patient much time and pain. (5) Any club foot can be corrected, but it is very important that the responsible parties be made to understand that they have to do their share and that it will usually take a long time. (6) The best form of appliance to keep club feet in position is plaster of Paris; muscle atrophy is negligible.—*C. B. Francisco, Kansas City.*

CONGENITAL DISLOCATION OF RIGHT FOOT WITH ALMOST COMPLETE ABSENCE OF RIGHT FIBULA. E. M. Simpson. *British Medical Journal*, Sept. 11, 1915.

A brief article with one cut describes a congenital dislocation of the right foot. There is a congenital absence of the fibula. The foot is so dislocated that it stands at right angles with the axis of the tibia. The lower end of the tibia is hypertrophied and acts as the walking stump. From the cut and from the description there appears to be no especial malformation of the bones of the foot. The foot was amputated.—*Wm. J. Merrill, Philadelphia.*

## VIII. TRAUMATIC LESIONS. FRACTURES AND DISLOCATIONS.

EMERGENCY SURGERY, WITH SPECIAL REFERENCE TO TREATMENT OF COMPOUND FRACTURES. B. O. Adams. *Colorado Medicine*, August, 1915, p. 231.

The author recommends emergency iodine dressing, immediate operation, and fixation. "Having satisfied ourselves that all possibly septic matter has been removed and having secured a perfect alignment of fragments, we should not hesitate to introduce foreign material, absorbable if possible, but non-absorbable, if necessary, to retain the perfect alignment we have secured. Having established a satisfactory alignment, the work of the osteoblasts and osteoclasts once done is final. The spaces to be bridged are reduced to the minimum, and when bridged will not be ruthlessly torn up for the purpose of alignment and plating after the soft-part wound is healed."—*Ellis Jones, Los Angeles.*

## THE BONE GRAFT PEG IN THE TREATMENT OF FRACTURES OF NECK OF FEMUR.

F. H. Albee. *Annals of Surgery*, July, 1915.

Indicated in all ununited fractures, in most unimpacted fresh fractures, in operable subjects under fifty, in all old fractures of the neck or at the epiphyseal cartilage where malunion has resulted, with the neck depressed in a coxa vara relationship with the shaft. An anterior incision is made, through which the neck is exposed, any interposing soft tissue removed and the ends of the bones freshened if necessary. An incision is made over the great trochanter and the proper direction for the drill determined by sight and palpation through both wounds. The drill hole should be situated through the center of the neck of both fragments. The peg is fashioned from the tibia. Accuracy of fit is very important: too tight a fit causes pressure anemia of the cancellous bone; too loose a fit failing to provide good fixation or favor immediate bony union. A long spica from the toes to the axilla is applied with the limb in the abducted position, and is followed in six weeks by a short spica, which is worn for another six weeks. A radiogram is printed of a case three months after operation, in which "firm, bony union resulted immediately."

The operation is beautifully planned, but to the reviewer seems to be too formidable to be lightly undertaken. If, as claimed, the peg will stimulate callus formation, produce bone growth itself and furnish an osteogenic bridge, can it not be placed accurately enough without the anterior incision? And if a large peg is used there will not be much opportunity for soft parts to be interposed between the fragments. No mention is made of the periosteum on the peg.—*J. J. Nutt, New York.*

FRACTURES. NEW IDEAS AND NEW INSTRUMENTS. H. R. Allen. *Journal A. M. A.*, Oct. 9, 1915, p. 1249.

This is a very interesting paper and is well illustrated, showing the author's method of the use of protruding nails, anchoring cleats, protruding wire loops thrown around bone, and the bone gimlet with low melting alloy handle, in the treatment of fractures. These are silver or silver plated with smooth sides. They are removed after union has occurred without secondary operation. The author's bone saw and his telescopic and double opposed wedge bone grafts are also described. These methods do not leave any foreign body in the tissue, and the Doctor has never had any infection.—*Edward S. Hatch, New Orleans.*

## PARTIAL BREAKING OFF OF THE UPPER SURFACE OF THE HEAD OF THE FEMUR.

Ferd. Bähr. *Archiv. f. Orth. Mech., u. Unfallchir.*, 1915, XIV, No. 2.

This is an interesting condition, the exact nature of which is only demonstrated in the radiograph. It followed an injury, possibly a dislocation, and caused considerable pain and disability for months after the injury. The author suggests that possibly some such injury may account for certain cases of traumatic coxa vara.—*George I. Bauman, Cleveland.*

FRACTURE OF TARSAL SCAPHOID. Baudet and Piqué. *Revue de Chir.*, XXXIV, No. 6, p. 861.

Authors present a case of a man 65 years of age, whose foot was crushed by a wagon wheel. An X-ray showed the scaphoid broken in three parts, which had become separated. The fragments were removed and arthrodesis done between the astragalus and cuneiform, with very satisfactory results.—*DeForest P. Willard, Philadelphia.*

**ARTHROPLASTY OF THE ELBOW.** A. P. C. Ashhurst. *Annals of Surgery*, September, 1915.

Report of five cases; two for bony ankylosis and three for marked limitation of motion following fracture. The technic of the operation is described in detail, each step being well illustrated. An external incision is used; the external condyle is reflected downward on the lateral ligament; the bones are dislocated by adduction of the forearm; both lateral ligaments are thus preserved; reliance is placed on resection of the humerus for shaping the new joint; a flap from over the triceps is interposed; the external condyle secured with two Lambotte's screws. Summary of results:

Case	Before Operation			After Operation		
	Flexion	Extension	Deformity	Flexion	Extension	Deformity
I	40°	145°	Varus	35°	150°	None
II	40°	110°	Varus	40°	170°	None
III	110°	110°	Ankylosis	45°	150°	None
IV	65°	150°	Posterior dislocation	10°	180°	Posterior dislocation (only in extension.)
V	110°	110°	Ankylosis	90°	120°	None

—J. J. Nutt, New York.

**FRACTURES OF LOWER EXTREMITY TREATED BY METHOD OF DELBET.** Berard and Fayol. *Revue de Chir.*, XXXIV, No. 6, p. 877.

The authors present a case of fracture of the lower extremity, which was treated by the method of Delbet. His walking apparatus gave good results and has the great advantage of allowing the patient to use the damaged extremity soon after injury.—DeForest P. Willard, Philadelphia.

**FRACTURE OF THE TRANSVERSE PROCESS OF THE FIFTH LUMBAR VERTEBRA.** Lloyd T. Brown and W. J. Dodd. *Boston Med. and Surg. Jour.*, Dec. 16, 1915.

In view of Rhuy's report of six so-called "Pseudo Fractures of the Transverse Processes" the authors report the following case:

Physician, age 42. When in college had backaches after becoming tired at football. Treated for tabes for last twelve years, chief symptoms being pain in back and legs, absent knee jerks, Argyll-Robertson pupils and ataxia. Several Wassermanns were negative. Acquired morphine habit, later taking treatment for this, which left him relaxed and weak. Then took outdoor physical culture course, and while riding horseback received a sudden jolt followed by localized pain, tenderness and ecchymosis in lower back. Two weeks later seen by the authors, presented increased lumbar lordosis, round shoulders, limited lateral and forward lumbar motion and definite tender points just inside the posterior superior iliac spines. X-rays showed sacrum set low between ilia and definite serrated breaks of both transverse processes of fifth lumbar vertebra. Treatment by belt designed to overcome lordosis and produce fixation. Three days later pain in legs and ataxia decreased. Three and a half months later radiogram showed evidence of callus and union of fractures, also there was marked relief from back and leg pains and ataxia.

These observations are made without any attempt at positive conclusions.—*R. Wallace Billington, Nashville.*

FRACTURES IN THE VICINITY OF JOINTS. C. E. Caldwell. *N. Y. State Jour. of Med.*, 1915, XV, p. 398.

Caldwell says that the diagnosis of fractures should be carefully made before the X-ray is used. The X-ray laboratory should stand in the same relation as the autopsy room does to the internist. In certain bad fracture dislocations of the shoulder often the best functional results are obtained by the removal of the head. Avulsion of the greater tuberosity of the humerus is usually better treated conservatively. Conservative measures, in his experience, usually suffice in fractures of the elbow in children. Hip-joint fractures should usually be treated conservatively, preferably by the abduction method advocated by Whitman. Caldwell says he has been using it for twenty years. He prefers not to loosen up on impaction, nor does he care to use the mallet, advised by Cotton. In fractures at the lower end of the femur, above the condyles, the control of the distal fragment is difficult. The flexed position is very good and efficient, but hard to maintain on account of discomfort. He prefers the double incline plane, with traction both in the long line of the tibia and femur. He has seen a few fractures of the tibial spine, but does not recall that there was any marked subsequent disability.—*M. S. Henderson, Rochester, Minn.*

AUTOPLASTIC REPAIR OF RECENT FRACTURES. Charles Davison and Franklin D. Smith. *Surg., Gyn. and Obstet.*, September, 1915.

Autoplastic bone surgery promises much in recent simple fractures of long bones, especially in those cases in which operation is necessary to reduce the fracture and where an internal splint is necessary to hold the position. Two methods of application may be used,—a periosteum free graft across the line of fracture, or a peg of living bone inserted across the fracture through the cancellous bone and anchored to the compact cortical bone of either end. The peg maintains the reduction, lives, and grafts to the surrounding bone.

The fate of the medullary transplant is studied and cases reported.

The author concludes that:

1. Autoplastic treatment of recent simple fractures is indicated where non-operative methods are inefficient.

2. The transplant in the medullary canal in recent fractures of the shaft of long bones supports the line of fracture, lives, and grafts to the compact bone of the fragments.

3. The transplant in cancellous tissue, when supported by contact to compact bone, grafts to the compact bone, and infiltrates the spongy bone with new bone, supporting the line of fracture.

4. The transplant eventually undergoes modification and absorption, as functional demand for support at line of fracture ceases.—*J. A. O'Reilly, St. Louis.*

TREATMENT OF FRACTURES OF THE UPPER END OF THE HUMERUS. R. E. Davison. *New York Med. Jour.*, Oct. 9, 1915.

Davison insists upon the open method in treating fractures of the upper end of the humerus, since a satisfactory reduction of the fragments cannot be accomplished otherwise without doing great damage to the important structures in this locality. A most rigid antiseptic technic must be observed in this as well as in all other bone surgery. The technic for abdominal surgery does not suffice in bone and joint surgery.

For a retentive apparatus the author uses plaster of Paris, reinforced with sheet-tin or wire. No skin protection is used under the plaster except over the breast or bony prominences, as the plaster splint holds much better if applied directly to the skin, and does not produce an irritation during the few weeks it is worn.—*R. B. Cofield, Cincinnati.*

THE POSITION TREATMENT OF FRACTURE OF THE FEMUR. L. Druener. *Münch. med. Woch.*, June 15, 1915.

The author recommends a double inclined plane, which raises the knee above the head and holds the thigh flexed at a right angle. There is no fixation used, the position alone being a sufficient fixation. The patient can move his foot, extend his flexed knee and receive massage, and be restored to the ranks in from eight to ten weeks. The apparatus does not look practical, and few men would think of using it except in an emergency.—*Walter G. Stern, Cleveland, Ohio.*

END RESULTS OF BONE FRACTURES. W. L. Estes. *Annals of Surgery*, September, 1915.

This is the report of the committee appointed by the American Surgical Association, of which Dr. Estes was chairman. The total number of cases collected was 1745; non-operative 1358 and operative 387. There were of the simple fractures operated 258, and of the compound 129 cases. The records of many of these cases were so incomplete that they could not be used in their entirety. The best results were obtained in the age-period under fifteen. Good anatomical restitution always results in the best functional result and has the shortest period of disability. When operation is done, the age-period makes little difference, except in senile cases. The average time lost from work in simple fractures was 9 to 14 weeks for the humerus, 10.8 weeks for the forearm, 7.37 months for the femur, and 4.75 months for the leg. The records for compound fractures were incomplete, but Estes found in his own cases (51) that the period of disability was 13 months for the femur, 6 months for the leg, and 4 months for the upper extremity. Shortening should not be more than 1 cm. in the humerus, 2 cm. in the femur, and none in the forearm or leg. As a rule, too little weight is used in traction. The gauge of the proper weight required is that necessary to overcome the shortening. This should be determined by careful daily measurement.—*J. J. Nutt, New York.*

USE AND ABUSE OF LANE PLATES. J. Frank. *Surg., Gyn. and Obstet.*, December, 1915.

Frank states that the perusal of the literature teaches one that:

1. Plates do not always fixate the fragments, as the screws often enough are loosened by an aseptic rarefying osteitis.
2. Plates do not act as trestle-work; on the contrary, they cause destruction of adjoining osseous tissue.
3. Plates do not stimulate osteogenesis; on the contrary, the primary firm fixation is a distinct hindrance to growth.
4. Unfortunate sequelae resulting from bone plating, such as persistent sinuses and stiffness in neighboring joints, are not at all infrequent.
5. From an economic point of view, no time is gained for the patient by operative treatment.

His personal views are expressed as follows: "Fractures were sustained, and the same treated long before the introduction of the roentgen rays. By all means let us use it, but we should not over-estimate the value of the

X-ray plate. In other words, our goal should be a good functional limb and not necessarily one that is restored to anatomical perfection. Such, in the vast majority of cases, can be secured with the old-fashioned methods used before the introduction of the operative treatment." Frank does not stand alone in his belief that perfect operative replacement does not necessarily insure a perfect functional result. Observing physicians are also learning that there is no definite time for the healing of a given fracture, and that frequently double and treble the text-book time is necessary to give the proper security. Particularly is that so in the weight-bearing bones of the lower extremity.—*C. A. Parker, Chicago.*

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**EXTENSION AND REDUCTION OF TRANSVERSE OR SERRATED FRACTURES OF THE FEMUR.** H. Gifford. *Annals of Surgery*, September, 1915.

The author claims to have found this method advantageous in reduction and immobilization of those fractures of the lower portion of the femur, whose fracture planes are either transverse or jagged enough to catch and hold each other once they are reduced. The material and the way it is used is described and illustrated. The patient is placed on his back upon a table, secured, and anesthetized. The leg is flexed to 30°, the hip to 90°, and, through tackle, traction is applied in the line of the tibia, approximately, but toward the knee; upward from the foot with the leg in this position. The distal fragment of the femur is drawn upward, forward anatomically, through the traction on the lateral ligaments, and the ends brought together in alignment of the bone. Foot, leg, thigh and pelvis are put up in plaster without disturbing this position. Plaster is removed in twenty days and patient remains in bed ten days longer and then allowed up with splints.

A table is given showing the lengths of the muscles in different degrees of extension of the hip and knee, the 90°-30° combination relaxing all the muscles except the gluteus maximus, quadriceps extensor, and part of the adductor magnus.—*J. J. Nutt, New York.*

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**A REVIEW OF THE LITERATURE OF FRACTURES.** T. W. Huntington. *Annals of Surgery*, September, 1915.

This article gives a brief, concise survey of the literature of fractures of the past decade. Only brief quotations or a simple statement of their opinion is given of most of the writers. A bibliography of thirty authors, however, make it possible to examine more fully into their teachings. The paramount question is that of conservative or operative treatment. Among the conclusions reached by the author are: that from 80% to 90% of long bone fractures can be successfully treated by conservative method; that resort to open method is of too frequent occurrence; that steel plates are a menace from the standpoint of permanency; that bone implant is the fixation material of choice; that internedullary splints are inferior to the autogenous bone implant; that fixation material of whatever type is not to be relied upon for maintenance of alignment, and that operative treatment of compound fractures should be withheld until the external wound healing is perfect.—*J. J. Nutt, New York.*

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**DISLOCATION OF THE SEMILUNAR.** A. S. Kitchen. *Jour. Mich. State Med. Soc.*, 1915, XIV, pp. 466-468.

The author reports one case of dislocation of the semilunar complicated with fracture of the scaphoid and two cases of uncomplicated dislocation of the semilunar. He is of the opinion that they constitute about 3 or 4%



of all injuries of the wrist joint. One case had the dislocation produced by a sudden violent dorsal flexion. The others were caused by falling on the hand, much in the same way as Colles' fracture is produced. As treatment, the semilunar was excised in one with perfect functional result—one was treated conservatively elsewhere with poor function. One was reduced under an anesthetic in the office, with perfect function. The diagnosis is made by the X-ray and a fullness on the dorsum of the wrist between the two folds of the wrist. There is also a distinct prominence of the dorsal surface in the region of the os magnum.—*M. S. Henderson, Rochester, Minn.*

#### APPLICATION OF DELBET'S EXTENSION APPARATUS FOR FRACTURES OF THE THIGH.

M. Lamare. *Presse Médicale*, Dec. 2, 1915, p. 484.

The author minutely describes the preparation and application of an apparatus designed to effect a gradual, progressive reduction of the two fragments in fracture of the femur, at the same time fulfilling the functions of a retentive splint, and permitting of dressings in open fractures.

Points of support are obtained at the ischio-pubic arch, the tuberosity of the ischium, great trochanter or iliac crest, and the femoral condyles or the malleoli, by means of moulded plaster of Paris bandages. Reduction is effected by adjustable springs inserted in specially designed metal rods which are interposed between, and securely incorporated with, the moulded plaster cushions.

While the theory which this method seeks to employ is most attractive, the method described appears difficult of application, requiring specially designed parts and tedious adjustments. It is not suited for fractures about or above the trochanter nor for those in the region of the condyles.—*Roades Fayerweather, Baltimore.*

#### KNEE JOINT DISABILITY CAUSED BY HYPERTROPHY OF THE ALAR LIGAMENTS.

Roland O. Meisenbach. *Journal A. M. A.*, Oct. 23, 1915, p. 1455.

The author considers that the alar ligaments play an important rôle in internal derangements of the knee. Being in close proximity to the moving parts, they may easily become hypertrophied, and so give symptoms. The condition is usually secondary to previous disease or trauma, the original symptoms of which have abated. Diagnosis is made by the history, by examination, which often discloses thickening on either side of the patella, and by roentgenographic findings, which show increased shadow, if very soft negatives are taken. Differential diagnosis from villous arthritis, lipoma, semilunar cartilage, strain, hypertrophic, atrophic and infectious arthritis, loose bodies and bursitis is given. Removal is recommended as the only permanent treatment. A few case reports are appended in which the hypertrophied alar ligaments were apparently responsible for the present symptoms with relief following removal.—*Eben W. Fiske, Boston.*

#### OPERATIVE TREATMENT OF BAD RESULTS AFTER FRACTURE. James E. Moore.

*Surgery, Gynecology and Obstetrics*, November, 1915.

Moore describes the operative methods practised by his associates and himself for the correction of deformities following fractures. The operations described include bone grafting for ununited fractures, nailing for fracture of the neck of the femur, osteotomy for bad positions after Pott's fracture, arthroplasty of ankylosis of the elbow joint, plating with Lane's plates and several osteoplastic operations for the improvement of function of the parts. The article is illustrated with skiagraphs.—*Arthur J. Davidson, Philadelphia.*

**INJURY OF THE CRUCIAL LIGAMENTS.** R. Morian. *Deutsche Ztschr. f. Chir.*, CXXXIII, Nos. 5 and 6, July 1915.

Injuries to the crucial ligaments must be counted as a rarity, although 36 cases were reported in the German literature in the last few years. The English and French literature on the subject is, however, entirely overlooked in this article. Rupture of crucial ligaments is often complicated with fractures of the articular surfaces of the tibia and femur. These fractures may be caused by the lateral pressure of the bony prominences of the one bone upon the other, while the injury takes place. The injury occurs when with the knee standing flexed at the angle of about 45 to 60 degrees, the tibia is forcibly rotated inward. The actual amount of violence necessary to produce this injury need not be great. Immediately after the accident an exact diagnosis is impossible, for at this age the knee is too tightly fixed and little motion is possible except under anesthesia. The X-ray and excessive lateral motion at the knee joint lightened diagnosis in older cases.

Osteochondrolysis is often mistaken for this condition, and vice versa.

The operative treatment of this condition is eminently satisfactory, where the foreign bodies can be removed and the torn ligaments sewed.

Osteoarthritis is to be feared as an eventual outcome of the joint injury.

The author does not use the vertical incision through the patella.—*Walter G. Stern, Cleveland.*

**FIRST AID TREATMENT OF FRACTURES.** J. Coleman Motley, *Old Dominion Journ. of Med. and Surg.*, September, 1915.

In a short address before his local society, Dr. Motley presented an interesting paper on the first aid treatment of fractures, and he enumerates the indications as follows: (1) To save life if it be in jeopardy through shock or hemorrhage; (2) to forestall systemic complications, as much as this is possible, through embolus, paresis, sepsis, tetanus and gangrene; to which end (3) asepsis becomes an indication secondary only to hemostasis. (To secure asepsis under field conditions implies doing as little as possible, and that little without touching the open wound until everything is sterile); (4) when the fracture is from a bullet, it may be accepted that it has usually stopped doing harm when it stopped moving, and can, therefore safely be left alone, for the present at least; (5) cranial fractures are in themselves comparatively insignificant; cerebral pressure, laceration and infection are the complications of serious moment; and lumbar puncture and urotropin seem the best prophylaxis against them; and, finally (6), while perfect alignment of misplaced fragments is the consummation to be hoped for, it is entirely secondary to the vital indications. But after all, the two indications, the vital one and good union, are not often antagonistic, for what secures the one goes far toward securing the other.—*John Dunlop, Washington, D. C.*

**THE TREATMENT OF FRACTURE OF THE HUMERUS.** Nussbaum. *Münch. Med. Woch.*, June 29, 1915.

The author recommends a triangular sling, and axillary cushion for all infected fractures of the humerus.—*Walter G. Stern, Cleveland, Ohio.*

**THE COMMON SHOULDER INJURIES.** Edward H. Risley. *Boston Med. and Surg. Journal.* Sept. 16, 1915, p. 418.

This article covers an analysis of four hundred and fifty cases of shoulder injuries. In it the writer emphasizes the importance of early diagnosis and due respect to apparent minor injuries.

In his series he finds that injury of brachial plexus is very rare. X-rays should always be taken.—*Frank R. Ober, Boston.*

**OPERATIVE TREATMENT OF CLOSED FRACTURES OF THE PATELLA.** Charles M. Remsen. *Southern Med. Jour.*, October, 1915.

Seven cases are reported and radiographs shown. Open operation is preferred to the closed method, except when some contraindication exists. Two loops of silver wire are used to hold the fractured patella together. Passive motion is begun in the third week. Treatment is finished in two or three months.—*F. G. Hodgson, Atlanta.*

**OPERATIVE TREATMENT OF FRACTURES.** C. L. Scudder. *Ohio State Med. Jnl.*, August, 1915.

Four factors, says Scudder, make possible the present progress in the treatment of fractures: ether anesthesia, aseptic surgery, Roentgen rays, and bone grafting. Results at present are poor from the functional standpoint, due to faulty setting. Bardenhauer, as the exponent of the non-operative treatment, and Lane as the advocate of the open or operative treatment, are the extremists. Scudder believes in an intermediate course, selecting, only after most careful consideration of all the possibilities, the wisest course of procedure. Both forms of treatment in their most efficient form give good results, and we must be guided by the consensus of opinion among men using the two methods. Scudder gives as an instance his increasing tendency to operative procedure in fractures of the femur involving the shaft of the bone.

Six guiding principles for the selection of the proper method of procedure are given:

1. The nearer to an anatomical reposition of the fragments it is possible to come, the greater likelihood of a good functional result.
2. A primarily early operation is more desirable than a delayed operation. Secondary operations are unsatisfactory.
3. There is less likelihood of the non-operative method being successful as age advances.
4. In childhood the results of the two methods are equally good.
5. The mortality in the operative method is negligible.
6. Many undesirable terminal conditions will be avoided if operative treatment is appropriately employed.—*Custis Lee Hall, Boston.*

**THE OPERATIVE TREATMENT OF FRACTURES.** Charles L. Scudder. *Boston Med. and Surg. Journal*, Sept. 2, 1915, p. 346.

In this article, non-operative treatment of fractures is reviewed. Scudder believes that what is good in both methods should be employed. In choosing between operative and non-operative treatment, he gives seven general principles as guides. Methods are not discussed.—*Frank R. Ober, Boston.*

**UNIVERSAL SUSPENSION APPARATUS FOR ARM AND LEG.** M. Sinclair. *British Medical Journal*, Sept. 18, 1915.

This brief article consists of a detailed description of a suspension apparatus for the purpose of slinging a fractured arm or leg, which is held in a trough. There are eight cuts, which describe the mechanism in such detail that the apparatus can be easily constructed from the description given. It would require a long article to describe this apparatus without reference to the cuts, but, briefly, there are two kinds, one which consists of an upright fastened to the head frame of the bed. This upright holds arms which extend over the bed, and to which pulleys are attached. Through these pulleys run cords from the trough, holding the upper extremity to weights which balance the arm and trough so that universal motion is possible. The same principle in suspension is applied to the leg, but in this case there is a

superstructure somewhat complicated, which is supported by attachments to the four corners of the bed, or which may be placed on the floor.—Wm. J. Merrill, Philadelphia.

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FRACTURES OF SESAMOID BONES OF THE THUMB. P. G. Skillern. *Annals of Surgery*, September, 1915.

Report of a case, which is the fourth to be recorded in the literature. Sketches are presented of dissections showing the normal bones *in situ*, their ligaments and fractures experimentally produced. A skiagram is printed of a most remarkable hand, there being two sesamoids opposite each of the metatarsal heads and one opposite the head of the proximal phalanx of the thumb.—J. J. Nutt, New York.

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AUTOGENOUS BONE PLATES VERSUS LANE'S PLATES. H. H. Trout. *Annals of Surgery*, June, 1915.

About 75 experiments were made on rabbits to determine the results of small steel screws in the presence of infection and of autogenous grafts under similar circumstances. Of the screws, 92% had to be removed, while 8% remained after developing sinuses. Of the grafts, 11% were removed and 89% remained in place and continuous with the rest of the bone, as proven by radiographs and autopsies four months after their insertion. Case related in detail of an infected, compound, comminuted fracture treated by autogenous inlay graft with perfect functional result without any of the pegs or grafts ever coming to the surface, and this in spite of the fact that there was almost constant drainage of pus for two weeks following the operation.

By experiments on rabbits it was determined that a steel screw placed in the epiphyseal line caused shortening in 40% of the cases, while with autogenous pegs no shortening occurred. Three cases reported of epiphyseal separation of the head of the humerus: one, treated with Lane plate had shortening of 3 cm., the other two were treated with autogenous bone pegs and had no shortening.—J. J. Nutt, New York.

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SOME EXTENSION APPARATUS IN FRACTURES OF THE LOWER EXTREMITIES.

A. Wildt. *Munch. med. Woch.*, June 29, 1915.

Another application of the double inclined plane in the treatment of the leg fracture; this time extension is used.—Walter G. Stern, Cleveland, Ohio.

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IX. MISCELLANEOUS DISEASES. GENERAL ORTHOPEDIC ARTICLES. PHYSICAL THERAPY. APPARATUS, ETC.

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ARTIFICIAL LIMBS FOR TEMPORARY USE. A. Angerer. *Munch. med. Woch.*, June 22, 1915.

A clever return to the peg leg of the 16th century. The weak point about the apparatus is that the patient must bear his entire weight upon the very end of the stump. The "War Movies" of the *Chicago Tribune* portray much better than the wording of this article, the wholesale fashion with which such artificial limbs are being applied, and the wonderful skill the bandaging assistants have developed in fixing the sheet iron straps of the peg leg to the skin of the stump, with a single short plaster bandage.—Walter G. Stern, Cleveland, Ohio.

**ERYTHROMELALGIA WITH SPONTANEOUS GANGRENE IN A YOUNG MAN.** G. Bikeles and K. Radonicic. *Wiener klin. Woch.*, XXVII, No. 30, July 29, 1915.

Bikeles reports a case of the above disease in 1912 in a young man of twenty-two, coming on immediately after an attack of angina with high fever. The patient complained of slight fatigue and cramp-like pains in the legs after walking. There was nocturnal pain in the legs, with redness, heat and marked sweating. Faradization for several months resulted in perfect recovery.

In 1914 he developed a second attack while serving in the army. Blebs developed on several toes, accompanied by hyperæsthesia, diminution in pulse in the dorsal artery of the foot, and finally spontaneous amputation resulted. The wet gangrene was converted into the dry by means of hot air. Although the condition led to spontaneous gangrene, the author regards his case not as one of Raynaud's disease, but as erythromelalgia.

Pathognomonic for erythromelalgia is the production of pain upon application of warmth, while cold seems to relieve. He believes the condition a vaso-motor trophic neurosis. Localized arteriosclerosis is excluded as an etiological factor by the very early demarcation.—*F. J. Gaenslen, Milwaukee.*

**THE MECHANICS OF PROTHESES FOR THE LEG.** Friedrich Wilhelm Brökenfeld. *Archiv. f. Orth., Mech., u. Unfallchir.*, 1915, XIV, No. 2.

This is another article illustrating the method of working out certain mechanical problems, especially in the making of artificial feet and legs. The German orthopedic surgeon has for years given considerable time and thought to the subject of artificial limbs. Possibly this is in line with the other evidences of preparedness on the part of the Germans for just such emergencies. There is no question but that he has and will have an abundance of material for the working out of such problems. Fortunately we in this country have little of this work to do.—*George I. Bauman, Cleveland.*

**SUBSTITUTES FOR AMPUTATED LIMBS.** M. Cohn. *Therapie der Gegenwart*, September, 1915, LVI, No. 9.

Cohn, who himself has lost his left forearm, speaks of the great demand made upon the makers of artificial limbs as a result of the present war. During the early months after amputation, while the stumps change considerably in contour, inexpensive peg legs are advised, though there are some objections against their use. According to present plans, these provisional peg legs are to be worn for about one year, when the shrunken stump will permit accurate fitting of the more elaborate artificial legs. Methods of fixation of these artificial legs to pelvis or to shoulder are discussed. The importance of sufficient flexibility of the fore-foot rather than motion at the ankle joint is emphasized.

The inadequacy of most of the present types of artificial hands is acknowledged. The "artistic" hand usually sacrifices function. The Carnes hand, an American make, is warmly recommended as the only one combining the essentials of both form and function.—*F. J. Gaenslen, Milwaukee.*

**THE OSTEOGENIC POWER OF PERIOSTEUM: WITH NOTES ON BONE TRANSPLANTATION.** J. S. Davis and J. A. Hunnicutt. *Annals of Surgery*, June, 1915.

The full text of this paper was first published in the *Bulletin of Johns Hopkins Hospital*, March, 1915, and was reviewed at length by Dunlop in the October issue of this Journal.—*J. J. Nutt, New York.*

**APPARATUS FOR MOBILIZATION OF STIFF JOINTS.** Engelhard, Nussbaum, Gary and Koehler. *Münch. med. Woch.*, June 22, 1915.

These are excellent articles, well worth reading, but too detailed for abstracting. They show very simple, very cheap and immensely practical pendulum apparatus for mobilizing stiff joints by active motion. They are just the thing for hospital and dispensary work, where economy must be the watchword. The reviewer believes they will be copied and brought into use for other than emergency purposes.—*Walter G. Stern, Cleveland, Ohio.*

**BACKACHE.** S. Epstein. *New York Med. Jour.*, Oct. 9, 1915.

Epstein takes up the question of backache from the orthopedic standpoint, emphasizing the importance of proper diagnosis and treatment.

Early diagnosis of Pott's disease should be facilitated by examining the patient with the underclothing removed, and the gait, posture and spinal movements tested. The tests for spasm of the psoas muscle and for spasm of the posterior spinal muscles, which are just as important as abdominal rigidity in acute abdominal disease, are not fully appreciated by the general practitioner. The general surgeon has removed appendices and ovaries and done laparotomies, where the patient might have been much better served by a spinal support or a plaster jacket.—*R. B. Cofield, Cincinnati.*

**LATE RESULTS OF EXCISION OF THE TRANSVERSE PROCESS OF THE FIFTH LUMBAR VERTEBRA.** Fred J. Fassett. *J. A. M. A.*, Nov. 20, 1915.

Author describes the methods of approach for removal of an overlapping transverse process of the fifth lumbar vertebra. In the cases operated on, relief was obtained from lumbar and sciatic pain that had persisted through faithful treatment by other means. It is suggested that the overlapping vertebra, in impinging on the crest of the ilium, acts as a strong lever, disturbing the balance in the sacro-iliac joints, giving symptoms attributable to this joint. The difficulties and dangers of the operation, in that the larger nerve trunks may be injured, are sufficiently great to cause it to be regarded only as a method of last resort.—*E. Laurence Scott, Birmingham, Ala.*

**MEDICO-MECHANICAL APPLIANCES TO USE IN BED.** Fuchs. *Münch. med. Woch.*, LXII, No. 38, Sept. 21, 1915.

With a system of pulleys attached to an upright frame work surrounding the bed on all sides, the author has devised a most excellent scheme for mobilizing stiffened joints through the voluntary efforts of the convalescing patient. Such a scheme could be advantageously introduced into the accident wards of any general hospital.—*Walter G. Stern, Cleveland.*

**AN AID TO A GOOD FUNCTIONAL RESULT IN ARTHROPLASTIES ON A DIGIT.** Paul Gallagher. *Journal A. M. A.*, Oct. 2, 1915, p. 1180.

This is an interesting instrument in which are used the cuff of an old rubber glove, a piece of bandage and a thin eight-inch strip, to which are attached rubber bands. The number and strength of the bands can be increased from day to day. The article is well illustrated and the illustrations should be seen to appreciate the apparatus.—*Edward S. Hatch, New Orleans.*

**TRANSPLANTATION OF ENTIRE BONES WITH THEIR JOINT SURFACES.** A. B. Gill. *Annals of Surgery*, June, 1915.

Report on the transplantation of the entire second metatarsal bone from one paw into another. Transplants healed in after more or less suppuration. Dogs were killed in from seven to eight months. One transplant was almost all absorbed; two were altered as result of osteomyelitis, but appeared to have served their functions and to present new bone formation; remaining five

were normal in appearance. The articular ends are apparently normal and the joints have perfect function except in those cases where the end of the bone was destroyed by suppuration. Microscopic examination of bones which healed with little or no suppuration shows no evidence of dead bone.

The theories of bone regeneration are discussed critically and at length. Some of the conclusions reached by the writer are: that bone contains within itself all the elements necessary to its life, function and regeneration, provided it receives sufficient nourishment; that periosteum, medulla and bony tissue should all be included in the graft; that as early function as is consistent with its fixation is of great advantage; that a mild infection is not necessarily fatal to the graft and that transplantation of long bones with their joint surfaces is clinically possible.—*J. J. Nutt, New York.*

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**EXPERIMENTAL TRANSPLANTATION OF THE EPIPHYSIS, WITH OBSERVATIONS ON THE LONGITUDINAL GROWTH OF BONE.** S. L. Haas. *J. A. M. A.*, Dec. 4, 1915, p. 1965.

This is a very instructive paper and the work of the men is reviewed and a careful description of the conclusions are as follows:

1. From the practically uniform failure of increase in length of the bones after transplantation of the epiphyseal cartilage, either alone or with an accompanying piece of the epiphysis and diaphysis, both in reimplantation and autotransplantation, it must be concluded the epiphyseal cartilage loses its power to functionate after such transplantations.

2. As the degenerative processes were more advanced in autotransplantation than in reimplantation, it can be almost certainly predicted that there would be a more marked degeneration in homotransplantation.

3. Whether a small or large-sized transplant was taken of no consequence, as there was the same failure of growth in every instance. Incisions into the periosteum or boring holes into the cortex hastened the degenerative processes.

4. There was marked disturbance of growth following the two-stage autotransplantation, in spite of the fact that osseous union was secured before severing the epiphyseal transplant from its surrounding and nourishing tissues.

5. The epiphyseal cartilage must be considered as a very vulnerable tissue, its viability being directly dependent upon its blood supply.—*Edward S. Hatch, New Orleans.*

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**TRANSPLANTATION OF BONE FOR NONREGENERATION OF THE TIBIAL SHAFT.** Melvin S. Henderson, *J. A. M. A.*, Jan. 16, 1916, p. 177.

A case is described in which a subperiosteal resection of the tibia had been done without regeneration. After a wait of three months more, no regeneration having occurred, a bone transplant from the other tibia was put in and attached at the lower end with a silver wire. Fourteen weeks later, while playing, the bone was fractured at the site of the silver wire. A second transplant was later made to bridge the fracture. The ultimate result was good.—*Edward S. Hatch, New Orleans.*

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**RAYNAUD'S DISEASE.** Archibald L. Hoyne. *Jour. A. M. A.*, Nov. 13, 1915.

The literature and reported cases of Raynaud's disease are reviewed. Hoyne thinks many of the cases reported were not true Raynaud's, apparently accepting Riggs' statement that "the occurrence of local syncope and local asphyxia, either separate or associated, constitutes what is known as 'Raynaud's phenomena,' but the additional element of gangrene is necessary to justify a

diagnosis of Raynaud's disease." In the records of the Cook County Hospital since 1911, covering about 30,000 patients annually, the author found only three cases, so diagnosed. The different opinions on etiology and pathology are discussed but nothing new is added. He advises only symptomatic treatment.

A case is reported in which the disease began after a series of acute infectious diseases,—scarlet fever, measles, otitis media, chickenpox and whooping cough, all occurring within forty-six days. The gangrenous process involved portions of both lower and both upper extremities, both cheeks, and both ears. Three days after the gangrene appeared patient developed broncho-pneumonia and died eleven days later. Necropsy performed by Dr. H. Gideon Wells and findings briefly stated. Nothing which could throw any light on the etiology was found. Cultures from a thrombus in the right femoral vein showed a green streptococcus and a hemolytic streptococcus.—*R. Wallace Billington, Nashville, Tenn.*

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LESIONS OF THE LUMBOSACRO-ILIAC REGION. A STUDY IN THE VARIOUS TYPES.

Harry L. Langnecker. *J. A. M. A.*, Nov. 27, 1915, p. 1866.

The author groups these cases into traumatic, with or without anatomic variations, static, toxic. In the first group, injury with sudden onset of symptoms is noted; the second group, defective posture; and in the third group, history of an inflammatory process is found.—*Edward S. Hatch, New Orleans.*

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TREATMENT OF CRIPPLED CHILDREN AT RAINBOW HOSPITAL, CLEVELAND. A.

Patton. *Cleveland Med. Journ.*, October, 1915.

This institution, situated at South Euclid, a suburb of Cleveland, can accommodate sixty-five patients in the winter and eighty-five to ninety in the summer. It is situated on a thirteen-acre tract of land in the open country, and, besides a visiting staff of ten physicians, has a resident staff of thirty persons, including the superintendent, and necessary assistants.

Children from two to thirteen years of age are admitted, preference being given to patients with bone and joint tuberculosis, osteomyelitic, paralytic and rachitic deformities. It also receives some medical cases. For the more active convalescents, the hospital provides a school with teacher and vocational workers to train the minds and hands.

Discharged cases are followed by visiting nurses especially trained for the work.—*C. A. Parker, Chicago.*

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OSTEOSCLEROSIS AND ANEMIA. F. Reiche. *Münch. med. Woch.*, Aug. 28, 1915.

The encroachment of the osteosclerosis of the bone upon the bone marrow causes a high degree of anemia. The compacted substance replaces the spongy. The entire bone seems to be heavier and contains more lime than usual.—*Walter G. Stern, Cleveland, Ohio.*

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ARTIFICIAL LIMBS AND AIDS. Spitzzy, Bade and Huebler. *Münch. med. Woch.*,

August 24, 1915.

The longer the stump, the better the function that can be expected from the prothesis. The best artificial limbs come from the United States, and the author would follow their principles, but would construct the artificial limbs according to the social needs of the patient. Economy is necessary in war time. Bade proposes that for each amputation two protheses be made, one to enable the patient to perform the duties of his trade; it is to be fitted with hooks, clamps, etc. The other is to be worn for æsthetic purposes, on the street and in public places, and is only an artificial limb in an æsthetic



sense. The author fashions such a prosthesis out of wire, wadding, tricot, and celluloid, at a cost of only 30 marks. Such an arm weighs 600 grams and can be made in two hours. Whenever the patient is financially able to bear the burden, in double amputations, the American system of artificial limbs is to be preferred.—*Walter G. Stern, Cleveland, Ohio.*

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THE NEWLY OPENED ORTHOPEDIC DEPARTMENT OF THE INNSBRUCK SURGICAL CLINIC. v. Haberer. *Wiener. klin. Woch.*, April 15, 1915.

v. Haberer describes a large building just opened and now used for orthopedic military purposes.—*Walter G. Stern, Cleveland, Ohio.*

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## X. WAR SURGERY.

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REINFORCED PLASTER SPLINTS, PERMITTING SURGICAL DRESSINGS. J. Abadie *Presse Médicale*, Nov. 4, 1915, p. 435.

This article describes a modification of the ordinary use of plaster bandages as employed in certain French military hospitals for immobilization of compound fractures. The chief feature is the application of the cast in two segments, above and below the site of fracture, and the connecting of these segments into a single rigid apparatus by means of outwardly-bowed spans of flexible iron bars. While there is nothing new in this method, it has been ingeniously adapted to provide elevation and support of the injured extremity, at the same time allowing ample space for the voluminous dressing generally required, and permitting of frequent changing of dressings and irrigation and inspection of the wounds with a minimum of disturbance to the patient. By comparatively simple means the apparatus may be elaborated so as to permit continuous traction on the distal segment. The figures which accompany this description are indispensable in explaining the text.

[NOTE:—The abstractor of this article was recently shown numerous cases in the American Hospital at Paris in May, in which this method of immobilization has been applied by Dr. R. B. Osgood, and was most favorably impressed by its efficiency. It would seem well adapted for use in civil practice.

It may be suggested that the difficulty sometimes experienced in firmly incorporating the metal strips with the plaster so as to produce absolute rigidity, can be obviated better by wrapping the bars at intervals with adhesive plaster, rather than with plaster of Paris bandages, as advocated by Abadie, before including them in the cast. The better to meet this objection, and because of the difficulty of obtaining the proper metal bars, the abstractor, working in another temporary military hospital, employed simple plaster of Paris "ropes" to unite the two segments of the cast, moulding them so as to curve in a wide arc over the intervening space. This was found a most satisfactory method, the "ropes" or trusses becoming as rigid as metal and extremely durable; but it does not permit of the same elaboration as the method herein described, which is certainly to be preferred when available.]—*Roades Fayerweather, Baltimore.*

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TECHNIQUE FOR RESECTION OF THE HIP IN MILITARY SURGERY. L. Bernard. *Lyon Chirurgical*, Oct. 1, 1915.

Bernard considers that hip resection, carried out after denudation of the great trochanter, involves too prolonged dissection and manipulations, and

consequently too great shock to an already weakened patient, to say nothing of the tendency of the femoral extremity to extensive displacement upward, and hence great shortening of the leg.

To operate rapidly and in a manner involving little trauma, and not likely to weaken the capsular ligaments, as also to give drainage, Bernard suggests the following operation, which, in his hands, has proved very successful.

1. Anterior incision from anterior inferior iliac spine, following axis of neck of femur and continued downward and backward, to cross a short distance below the top of the great trochanter.

2. Dissect between the tensor fascia femoris on the outside and the sartorius, and proceed on the inside and expose the capsule, which is incised.

3. With an osteotome decapitate the femur, the head being removed with lion-toothed forceps.

4. Counter opening for drainage made by a stab emerging behind great trochanter.—*J. A. Nutter, Montreal.*

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UNION OF SURGERY AND ORTHOPEDICS THE FIRST STEP IN WELFARE WORK FOR MAIMED SOLDIERS. E. Blind. *Munch. med. Woch.*, July 6, 1915, LXII, No. 27.

Blind says very truly that the time to work for the securing of a minimum amount of crippling in the wounded is not after the wounds have healed and the soldiers discharged with a crippled or unusable part, but while the injury is fresh. He, therefore, urges that military surgeons apply orthopedic principles to the treatment of injuries from the start. By doing this, much time may be saved both for the individual and the state, as, instead of the wounded men being discharged from the hospital with ankylosed joints, weakened muscles, deformities and sensitive scars, which require long periods of treatment to overcome, they will be in a position at once to make use of what the injury has left them.—*W. D. Dickson, Philadelphia.*

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WIRE EXTENSION TRIANGLE FOR TREATMENT OF FRACTURES OF THE UPPER ARM. E. Borchers. *Munchener med. Wochenschrift*, Aug. 10, 1915, LXII, No. 32.

The author states that of all war injuries, the treatment of complicated fractures of the extremities affords the greatest difficulties. He discusses the various methods of fixing the arm after a gunshot fracture of the humerus, and describes the method which he advocates. He uses a piece of Krammer wire splint, 10 cm. From one end this is bent at an angle of about 60°, and the angle placed in the sound axilla, and the distance to the elbow measured. Here the splint is bent again at an angle of about 60-70°; the lower arm of the triangle so formed is bent outward and the whole properly padded. By applying one side of the triangle to the side of the thorax and the arm and forearm to the other two sides by adhesive, the shoulder is kept in abduction, the elbow in flexion, and the arm in external rotation (the best position); while sufficient extension is secured to maintain the fragments in position. A good exposure can easily be secured for dressing wounds, and the apparatus is light and cheap and can be used for fractures of the arm at any joint.—*F. D. Dickson, Philadelphia.*

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TREATMENT OF PENETRATING WOUNDS OF THE KNEE. X. Delore and Kocher. *Presse Médicale*, Nov. 25, 1915, p. 473.

During their experience in a military advance-hospital, the authors were able to observe the final results in 46 of the cases which they treated for wounds penetrating the knee joint, of which number 44 were caused by shell

fragments. Grouping these cases according to their similarity from the point of view of the various structures involved, the amount of physical damage revealed and the treatment applied in each case, the authors conclude that in the majority of such cases the best results are obtained from immediate arthrotomy (within 4 to 6 hours from the time of injury), before the development of infection.

Such operations should consist of extensive exposure of the joint, followed by painstaking search for all particles of foreign material, the removal of all clotted blood and broken bits of bone, and the arrest, by hæmostasis, of any fresh bleeding. After this, the whole cavity is to be thoroughly washed out with a sterile, non-caustic solution, carefully dried, and the synovial cavity then closed without a drain,—except in cases where a drain may be necessary because of bleeding from bone. It is, however, necessary to drain the tract of the wound leading to the cavity.

Where the condyles or tibia have been more extensively fractured the authors prefer an immediate resection of the joint, before the occurrence of infection, i.e. in the first four to six hours. In the same way, extensive destruction of the patella calls for its complete removal.

These rules of procedure had been carried out by the authors during the last six months preceding the publication of this article, and were adopted because of their dissatisfaction with the results of delayed arthrotomies and less radical measures.

In support of their practice they emphasize the superior results thereby attained, namely, a saving of many weeks of painful dressings, with constant danger from the continuance of suppuration; the frequency with which functioning joints are obtained, and mutilating secondary operations avoided. In their own words: "It is, in short, these benign and uncomplicated post-operative recoveries that we wish to emphasize in concluding; it is also the *quality* of the result. After this treatment, perfect or almost perfect restoration of motion is constant; there is no fever, no ankylosis, no arthritis (meaning infection). We owe this result to the immediate and direct treatment of the lesions; this fact cannot seriously be disputed."—*Roades Fayerweather, Baltimore.*

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TREATMENT OF GUNSHOT AND SHELL FRACTURES OF UPPER ARM. C. Goebel. *Münchener med. Wochenschrift*, Aug. 3, 1915, LXII, No. 31.

For gunshot fractures of the humerus, upper or lower end or middle, Goebel uses a fixed plaster dressing, applied as follows: A pad is placed in the axilla, and with the elbow flexed to a right angle or less, the forearm in supination and the wrist in slight dorsal flexion, a plaster gutter splint is made, running from the upper inner border of the scapula to the web of the fingers; the width of the splint is about 10 cm. This is bound to the arm with a muslin bandage, except at the elbow, and allowed to dry, when it should fit closely to the extremity, except where it is unconfined at the elbow. Here the weight of the plaster should cause it to sag and leave a space the width of three or four fingers between the olecranon and the splint. This dressing holds the fragments well, and by applying a bandage about the elbow and drawing it down into the cast, extension can be made on the fractured humerus. The only contra-indication for the treatment is a wound which requires a large dressing.—*F. D. Dickson, Philadelphia.*

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GUNSHOT FRACTURES OF THE EXTREMITIES. Robert B. Greenough, Robert B. Osgood and Beth Vincent. *Boston Med. and Surg. Jour.*, Jan. 13, 1916. This is a report of work from Apr. 1 to July 1, 1915, in the University

Service of the American Ambulance at Neuilly-sur-Seine, France. Of 148 fractures in 132 patients there were 129 compound and 19 closed. Injuries were mostly received in trench fighting. Causes were as follows: shrapnel, 4; fragments of high explosive shells, 45; rifle bullets, 38; unknown, 27.

Types of fracture: Bullets sometimes caused "butter-fly" fractures of the shafts and "gutter" or "drill" fractures of the cancellous portions. Many of the bullets and nearly all of the other fractures were comminuted with extreme laceration of soft parts.

Infection: Of 121 compound fractures, only 3 healed without infection. Cultures made from 100 infected cases showed gas-producing organisms in 28; others were ordinary pus-producing organisms. All cases had received first aid dressings 24 to 72 hours before reaching the hospital, by which time infection had usually set in. Cultures from a number of soldiers' clothing showed gas bacilli.

Treatment: First aid dressings consisted of iodine applied to the wounds, and tin or aluminum splints for fixation. On entrance to the hospital, under anesthesia the field was shaved, dried and iodined, wounds of entrance and exit enlarged and explored and foreign matter removed as far as possible, also detached bone fragments and splinters. Then irrigation with saline, weak iodine or sodium hypochlorite (1:200) solution, and drainage with rubber tissue or "protective." Plaster of Paris casts, with bridges of wire gauze or iron in the compound cases, were the most universally satisfactory dressing. Traction was used, and frequent wet dressings or constant irrigations with sodium hypochlorite in septic cases.

Only one case died, due to gas bacillus septicemia. An anti-gas-bacillus serum was used in some cases, but its value was undetermined. There were two severe secondary hemorrhages. Orthopedic measures for prevention and cure of ankylosis and contractures were often needed.—*R. Wallace Billington, Nashville.*

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IMPROVED TECHNIC FOR PLASTER CASTS. Hans, Riffel and Müller. *Munch. med. Woch.*, Aug. 17, 1915.

These articles deal with the difficulty of properly fixing the many suppurating gunshot fractures seen at the base hospitals. The experience of the three different writers has led them to three different conclusions. The first one thinks bridged casts to be the best. The second would always use double inclined planes without extension, while the third advocates extension.—*Walter G. Stern, Cleveland, O.*

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TREATMENT OF SEVERE FRACTURES AND JOINT INJURIES IN FIELD HOSPITALS. Heddaeus. *Munch. med. Woch.*, Oct. 5, 1915, LXII, No. 40.

The author speaks of the importance of starting definite treatment in field hospitals, not postponing until permanent hospital is reached.

Fundamental principles:

1. Proper setting of fracture.
2. Immediate application of extension; latter must be transportable.

In simple gunshot wounds, he describes his plaster of Paris extension apparatus (well illustrated). This essentially consists of the following parts: first, the extension bandage of plaster of Paris; second, counter extension applied to the tuber-ischii and iliac spine by aluminum splints; and third, a window which permits inspection of the wound.

The advantages of the method are:

1. Movements and massage of leg possible.
2. Avoiding stiffness of knee joint and muscle atrophy.

Fracture of femur with great laceration of soft parts. He used aluminum to gap over lacerated area, and plaster of Paris used in counter extension, as in former case. Also the aluminum about part to hold extension.

Injury to shoulder joint and arm injuries, where the aluminum gaps over the area of wound to allow dressing. He also calls attention to Billroth's batiste at edge of dressing to prevent soiling and wetting of plaster. This type of dressing is especially applicable because it can be applied to the most septic joint and save many limbs.—*John Dunlop, Washington, D. C.*

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APPARATUS FOR WAR ORTHOPEDICS. Heymann. *Münch. med. Woch.*, August 31, 1915.

For the purpose of mobilizing stiff fingers an excellent scheme has been devised. A good glove, which has small rings inserted at the tips of the fingers to be treated, is drawn and buttoned over the hand. In cases where the fingers are to be flexed, the springs are fastened in front to a leather wrist cuff; where the fingers are to be extended, the springs are fastened to a wire lattice, fixed to the back of the hand. Adhesive plaster can be used in place of gloves.

For drop foot, the same principle is used. The springs in this case are fastened to a leather anklet.—*Walter G. Stern, Cleveland, Ohio.*

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LENGTHENING TIME OF MILITARY SERVICE BY PROTHESIS FOR LEG. Hoeftmann. *Zentralblatt für chir. u. mech. Orth.*, March, 1915, p. 49.

The great master in the manufacture of prostheses has succeeded in making a captain of the Prussian army able to do service in the field with a prothesis for the left leg amputated in the middle of the thigh. Illustrations show the patient standing, climbing, and riding horseback. The amputation was done Oct. 6, 1914, and the patient was discharged Dec. 23, and applied for field service Dec. 28. Hoeftmann points out the importance of wearing the prothesis as soon as possible, and of having the patient do exercises with it immediately, such as ascending and descending stairs, etc.—*C. H. Bucholz, Boston.*

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WOVEN WICKER SPLINTS. Kessler. *Münchener med. Wochenschrift*, Aug. 3, 1915, LXII, No. 31.

Kessler states that woven wicker splints have been extensively used by the field surgeons. The advantages which recommend them are: lightness, which enables a large number of splints to be transported in a limited space; ease of fitting, firmness, durability, and the ease and cheapness of construction. A description of the method of making the splints appears in the original article.—*F. D. Dickson, Philadelphia.*

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HEALED SHRAPNEL FRACTURES OF JAWS COMBINED WITH EXTENSIVE SOFT PART INJURIES. M. Kraus. *Wiener klin. Wochenschrift*, XXVIII, Nos. 21, 22, 23, May 27, June 3 and 10, 1915.

The present war appears to produce a higher per cent. of injuries of the face than any previous war, due to the fact that the face and head are the most exposed portions of the body in trench fighting. In fractures of the jaws, early restoration of function is the first requisite. Coöperation between surgeon and dental surgeon is absolutely essential for the best results.—*F. J. Gaenslen, Milwaukee.*

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IMPROVED PLASTER CASTS. F. Kuhn. *Münch. med. Woch.*, June 1, 1915.

APPLYING EXTENSION APPARATUS INSTEAD OF FIXATION BANDAGES. By J. Szilagy. *Münch. med. Woch.*, June 1, 1915.

The startling frequency of infected fractures in the present war can be

gained from the various rehashings of old methods of bandaging that have to do with fixation combined with free drainage, which were almost forgotten in civil life. One article advocates and explains the method of applying bridged casts, and the other article advocates extension only, for the same purpose. Were it not for the absolute necessity of spreading the knowledge of treating infected fractures on all sides, such articles would never be given space in a journal of the high quality of the *Munch. med. Wochenschrift*.—*Walter G. Stern, Cleveland.*

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**TREATMENT OF GUNSHOT FRACTURES OF LEG WITH POSTERIOR WOUNDS.** C. A. Morton. *British Med. Jour.*, Aug. 28, 1915.

This is a brief article describing a fixation apparatus for gunshot wounds of the leg in which there is a posterior wound. There are two cuts. This apparatus consists of a base board about the same width as the leg, extending the desired length. On the upper end two uprights are fixed so as to take their position on each side of the leg and extend a little above the center of the leg. At the lower end (at the foot) there is fixed an upright; at its foot it is attached to the base board and at the top the patient's foot is fixed. Between the two uprights at the upper end and the upright at the lower end of the base board there are two metal rods so placed that they are horizontal to the base board and extend along the leg, which is suspended by means of slings attached to the metal rods. These slings are made of heavy cloth or canvas and can be adjusted at will. The foot is bandaged to the lower upright and the upper end of the base board is made firm to the upper portion of the thigh.—*Wm. J. Merrill, Philadelphia.*

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**FIRST IMPRESSIONS OF THE OPPORTUNITY FOR ORTHOPEDIC WORK AT THE AMERICAN AMBULANCE.** Robert B. Osgood. *Boston Med. and Surg. Journal*, July 1, 1915, p. 7.

Under the above title, Osgood, who was with the Harvard unit under Dr. Nichols in France, gives some impressions of war surgery from an orthopedic point of view.

In speaking of fractures, he says they are long-continued cases. Comminuted fractures and fractures near joints often result in ankylosis.

He describes briefly the treatment of bone wounds and fractures near joints.

He also emphasizes the prevention of deformity from an economical standpoint.—*Frank R. Ober, Boston.*

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**GUNSHOT AND SHELL WOUNDS OF THE JOINTS, AND TREATMENT.** E. Payr. *Munch. med. Woch.*, LXII, Nos. 38 and 39, Sept. 21 and 28, 1915.

Foreign bodies in the neighborhood of joints often lead to the severest joint infections.

In the treatment of such infectious arthritis the foreign body and infecting focus must be thoroughly removed at the earliest possible moment. This is often a most difficult procedure and the joint is often pierced in so doing. When the infecting focus is in the injured bones, in the neighborhood of a joint, only radical extirpation of same will be of any avail; perfect drainage and counter-drainage must be instituted.

Shrapnel fragments, removed by open incision within the first 24 hours, are not to be feared.

Infected joints themselves must be laid wide open without regard to the fate of the joint itself, if life and limb are to be saved. Infected material must be removed, the joints loosely packed with gauze and the severed tendons temporarily pocketed in the soft tissue out of harm's way.

Arthrectomy and resection are not often necessary if the above rules are followed. But where the infection continues unabated Payr has found these operations to be the operations of choice.

Amputations and exarticulations were performed only as secondary measures.—*Walter G. Stern, Cleveland.*

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**BONE ATROPHY FOLLOWING BONE INJURY BY MISSILES OF WAR.** L. Peck. *Lyon Chirurgical*, Oct. 1, 1915.

The author states that in his X-ray examinations bone atrophy (probably meaning increased radiability to the X-rays) has been observed to follow prolonged suppuration.

He thinks this bone atrophy is much less accentuated in the cases where there has been an early removal of bony fragments likely to necrose. He knows the atrophy is also less marked in subjects that have been treated by heliotherapy.—*J. Appleton Nutter, Montreal.*

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**THE TECHNIC OF TREATING FRACTURES IN WAR TIMES.** H. Perthes. *Münch. med. Woch.*, June 1, 1915.

Another lecture, this time by a recognized authority, to non-surgical physicians doing surgical war work well beyond their capacity. The immobilization of gunshot fractures must be most complete. Any jar or motion while the wound is dressed does more harm than good. The plaster cast must be widely fenestrated to allow free access to the wound. After the wound is healed, extension or other measures may be applied as in civil life.—*Walter G. Stern, Cleveland.*

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**THE TREATMENT OF WAR INJURIES OF THE ARM.** E. F. von Redwitz. *Münch. med. Woch.* Oct. 12, 1915, LXII, No. 41.

Special attention is called to the orthopedic after-treatment to be taken into consideration with general treatment as soon as patient comes under observation, Zuppinger's method of extension in semi-flexion being that most used in treatment of such injuries. He had opportunity to observe a great many cases, and results were bad whether immobilized in plaster of Paris or splints. Extreme atrophy of muscles, especially of deltoid, marked shrinking of capsule of shoulder joint, as well as inability to abduct the arm ten to twenty degrees, with very marked limitation of rotation of the arm, were almost the rule in these cases. This refers not only to injuries of the upper arm, but to more distant injuries, such as elbow and forearm. He calls attention to the abduction method of fixation as emphasized by Vulpinus and Goebel. He not only practises abduction in upper arm injuries, which he did in this way some time ago, but now all arm injuries.

Redwitz sums up his article in these words: "The most essential part of our experience in treatment of the injuries of the arm, has been that in all injuries of the arm, whether at the shoulder joint or in the region immediately surrounding it, not enough stress has been laid on early abduction of the arm, and that these abducted methods in fixation are not resorted to early enough. Eventually they always lead to good results. Personally we have obtained the best results with the double right angle fixation of Zuppinger, and the single right angle splint devised by Christian."—*John Dunlop, Washington, D. C.*

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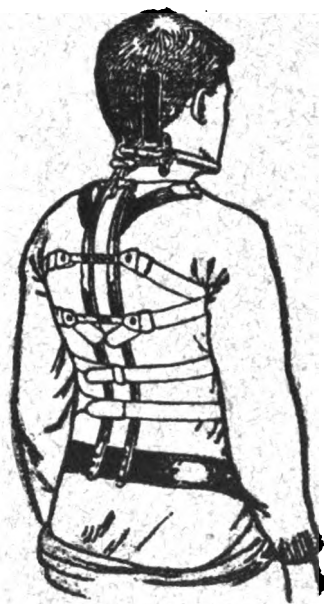
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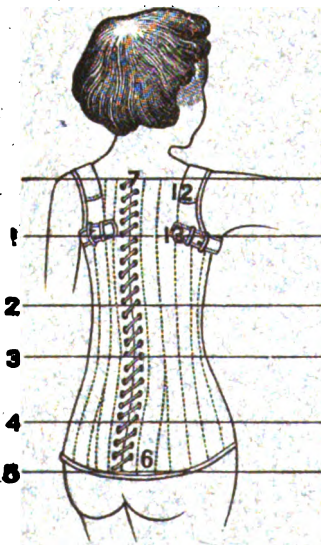
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## THE ADVANTAGE OF A STATE HOSPITAL FOR INDIGENT CRIPPLED AND DEFORMED CHILDREN IN THE ADVANCEMENT OF ORTHOPEDIC SURGERY IN THE STATE.\*

BY ARTHUR J. GILLETTE, M.D., ST. PAUL, MINN.

Professor of Orthopedic Surgery, University of Minnesota; Surgeon-in-Chief, Minnesota State  
Hospital for Indigent Crippled and Deformed Children, Etc.

INCOMPATIBLE is the only word, in my opinion, from observation and experiences of over twenty-five years, which exactly expresses the difficulty under which a man is laboring when he attempts to practise under the title of "General and Orthopedic Surgery." In years gone by this title has been used to designate a teaching chair in a medical college, and time has demonstrated, again and again, that the holder of such a title is usually either an excellent general surgeon or a very good orthopedic surgeon, but never does he excel in both. This reminds one of the views expressed by the "Great Physician" who said, "No servant can serve two masters; for either he will hate the one and love the other; or else he will hold to the one and despise the other."

The more we observe the development of general surgery and the progress of orthopedic surgery, the more widely do the two specialties diverge. The general surgeon, from the usual pathological conditions with which he has to contend, is necessarily taught to destroy diseased tissues; the orthopedic surgeon to restore undeveloped or abnormally developed tissues, and, naturally, the general surgeon finds that the more quickly he can accomplish the removal of diseased tissues, the

\* Read before the Central States Orthopedic Club, St. Paul, Minn., October 12, 1915.

better are his results, while the orthopedic surgeon usually is dealing with a class of cases in which it is impossible, in most instances, to get quick results as he must bide his time and build up the local and general condition and make the crooked straight gradually. Then, too, surgery in the young and growing is very different surgery from surgery in adults, and orthopedic surgery still has to do more with the young and growing than it has to do with adults, notwithstanding the fact that there is a great deal of adult orthopedic surgery.

Necessarily the general surgeon's teaching and practice is for radical measures while the orthopedic surgeon is for conservative and mechanical measures, because of the difference in the pathology and age of the patient. This was the very reason in the early days for orthopedic surgeons. The same condition exists today almost as positively as it did years ago. We recognize, of course, that in some cases of orthopedic surgery radical measures and immediate cutting surgery are necessary, yet in every instance, no matter what the operation may be, it is necessary, in order to obtain the best results, that the operation be followed by some form of mechanical treatment. Therefore, a man must have special training in the mechanics of surgery in order to do orthopedic surgery.

You observe that I use the term mechanics of surgery. The term, 'mechanics of surgery,' is used here, not in the sense of being a good brace-maker or having a mechanical turn of mind for making braces or instruments, but a man must have a special knowledge of the mechanics of the human anatomy. While, to some extent, the mechanics of inanimate things resembles the mechanics of the human body, and although we have used the terms, 'flexion of joints,' 'the extension of joints' and 'the rotation of limbs,' etc., produced by the mechanical action of the muscles, yet when we study the movements of the joints, muscles and bones in the body, they are very different from the manufactured joints which are designed by the mechanic in the workshop, and the movements under the control of the human mind are really not to be compared with machinery except in a general way. We have no such thing in machinery as inflammation causing certain mechanical changes, or reflex irritation causing certain mechanical movements, or the reduction of inflammation to check certain reflex muscular spasms, or fractures or dislocations causing certain mechanical defects, or growths causing mechanical changes in the use of muscles and joints.

As we know more and more about the causes of inflammation in certain conditions, the better do we understand the mechanical conditions produced by such pathological changes. In other words, it is often

evident that a man who cannot drive a nail straight or put up a common board fence, may become an excellent orthopedic surgeon if he understands the mechanical action of each muscle with which he has to contend. He must understand the changes produced in the action of these muscles by inflammation, joint diseases, dislocations and fractures, as well as the pathology of the various diseases bringing about these deformities and reflex muscle actions produced secondarily. In order to reduce a fracture or dislocation or a deformity he must take into consideration the particular mechanical actions of bones, joints and muscles with which he has to combat, and, therefore, construct his mechanical device, if mechanical treatment is necessary, accordingly.

It is really, however, in the nursing and the care of orthopedic cases that the orthopedic hospital is the most indispensable. It is very seldom, in fact extremely rare, that any orthopedic training whatever is developed in connection with a general hospital or even a general medical and surgical clinic. The large orthopedic institutions are, in almost every instance, developed separately and distinctly from a general hospital. If you for a moment consider how they differ in every respect, it is certainly quite comprehensible. In the first place, you will always observe that, in order to develop a good orthopedic hospital, you must have enthusiastic surgeons, men who are interested in this particular line of work. You must have good orthopedic nurses as well as house doctors who are especially interested in orthopedic surgery, and they must have special training in the mechanics of orthopedic surgery, that is, they must know why a child is placed upon a Bradford frame, or why a child has on an extension weight and pulley, and why a plaster cast is adjusted in some cases with the limb abducted or adducted, why the weight and pulley cannot be taken off while the child's bed is being made or the sheet changed, why a small rope which is attached to the weight and pulley, if it breaks, should not be tied in a large knot just above the pulley, and if the child slips down in bed and the foot comes down and rests upon the pulley, why the limb is no longer being extended, why, if the child has a severe cervical Pott's disease, it is not good treatment to take off the weight and pulley attached to the chin-piece while the child is being bathed or fed. Some idea should also be given as to why fixation is thought necessary in tuberculous joints. They should also be taught, or at least be given some idea as to why the stiffness of a joint, due to reflex spasm, will be overcome by rest, while it will not be overcome by massage or passive motion. It might also be well to instruct them as to why a psoas abscess receives different treatment than an appendiceal abscess; why with the one you deal so radically and with the

other you are so conservative. I repeat, that unless your nurse thoroughly understands the nursing of an orthopedic case, it is almost impossible to have the child get any better care in the hospital than it will get in its own home, where you frequently do take time to instruct the mother as to the why and wherefore of it all.

I have found it very discouraging in general hospitals with an orthopedic ward or beds to get the house doctor to take any interest whatever in the case. Of course, he is young and very enthusiastic and he enjoys the blood and thunder surgery and he grows tired of putting on bandages, removing plaster casts, dressing tuberculous abscesses, or adjusting splints and braces of which he has not the slightest idea what is expected, and he grows tired of spending weeks and weeks in caring for a patient, while in the next bed he has cured, as he calls it, several amputations, a number of simple fractures, removed enlarged glands, or a number of ingrowing toe-nails. Yet you and I know that if he has treated successfully a case of tuberculous hip disease or a tuberculous abscess he has accomplished more, scientifically, considering the greater difficulties encountered, than he did in every one of the other cases which he has cured so rapidly by general surgery. Naturally he grows tired of dealing with this one case, and not thoroughly understanding the reason for it all, you can hardly blame the house surgeon, who has no knowledge of orthopedic surgery, if he "ducks" when the orthopedic surgeon comes to make the rounds. And, as a result of this, he leaves the hospital without any orthopedic training or knowledge of the pathology and treatment of orthopedic surgery.

Another experience which one meets with in attempting to treat an orthopedic case in a general hospital is the endowed beds. Some kind person endows a bed in the general ward or the children's ward of a general hospital, and you succeed in getting into this bed a child with a tuberculous disease of the spine or of the hip, and in about the length of time it takes to cure a case of tonsillitis or an ordinary simple appendicitis, the donor comes around and wants to know why it is that you are taking so long to cure this case of hip-disease or spinal disease, as the case may be. They are dissatisfied because they know nothing about the conditions with which you have to contend and they are only anxious to have as many people as possible occupy their particular bed, and do not appreciate the difference between curing a child with a tuberculous hip or spine and a circumcision. The only thing they are enthusiastic about is the number of people who have been cured in their endowed bed during the year.

I am not complaining. It is perfectly natural to expect this. Then

too, from the hospital standpoint, surely they wish to make as good a showing as possible, and the curing of a case of club-foot takes so long and the bed is occupied by only one person for so long a time, when, if they could only have a few patients for the removal of glands or a few cases of ingrown toe-nails, they could make a much better showing, numerically, at the end of the year. As I said before, I am not complaining of the superintendent, or the attendants, the doctors or nurses, or the lady board of managers; I am simply stating the facts, and facts which you all have to contend with when doing orthopedic work in general hospitals, and all this naturally militates against orthopedic surgery simply because people do not understand the difference in the diseases with which we are contending.

One of the most amazing things, and this is really coming to the subject of my paper, is how orthopedic cases seem to develop when there is an orthopedic surgeon or an orthopedic hospital to treat them. Well do I remember when I consulted a few of my medical teachers and asked them what they thought of my taking up orthopedic surgery in Minnesota. They said, "It is very nice work if you like it, but you can not possibly make a living from it for there are not enough cases, and then too, when deformities do develop they always seem to thrive best in a poor family." To a certain extent this is true, but the reasons are explained in both instances. The cases were apparently rare because, rich or poor, they were never advertised by parents or any members of the family, or, at least, they were not twenty-five years ago, for the reason that in those days it was considered a disgrace to have a deformed child in the family. Even as recently as twenty-five years ago, it was generally supposed that a deformed child was caused by some horrible mental impression which the mother had had, or that there was some loathsome disease in the family, or that the child had been neglected and had a fall, or that the misfortune was due to near relatives marrying, and the parents many times really hoped and prayed that the child might die. Today, in this intelligent age, we know that the above is not true by any means. It is seldom, if ever, that any form of disgraceful disease, or maternal impression, etc., has anything to do with the deformity, and, best of all, over eighty per cent. can be relieved of deformity and pain, but it requires a good orthopedic hospital in many instances, and, above all, a well trained orthopedic surgeon to do it.

I do not believe there is anything which will place before the people and doctors more positively and more practically what can be done for the crippled and deformed than a hospital built and conducted solely for the care, treatment and education of the crippled and deformed,

and nothing is so conducive to a large and lucrative practice in orthopedic surgery as to be in the locality of an orthopedic hospital managed by good orthopedic men. I am speaking entirely from a selfish standpoint, hoping to interest men more and more in the development of a State orthopedic hospital to care for the poor.

I have referred in this paper before to the fact that the larger the facilities for treating the crippled and deformed, the greater are the possibilities for men to develop a large orthopedic clinic; not only a private clinic, but a hospital clinic as well, for it is not only the people who must be taught the benefit of orthopedic surgery, but the general physician and surgeon also, because only in this way is their attention brought to the possibilities in curing the crippled and deformed. It is quite surprising how little knowledge the general surgeon and medical men have of the late developments in orthopedic surgery. This is partly due to the fact, I regret to say, that orthopedic surgery is not taught nor the attention given to it in our medical colleges which it and its great benefit to mankind deserves. It is not unusual for me to meet young men just out of a medical school who, when I ask the name of their orthopedic professor, after thinking a moment, frequently admit that they do not recall his name. This is usually the fault of their teacher or of their school—possibly both. I find, also, by letters of inquiry, that there are a number of our regular and so-called up-to-the-standard medical schools which do not require an examination of their students in orthopedic surgery, and the course is an elective one. I know of nothing that will educate the people and educate the general surgeons and doctors as to the remarkable development in orthopedic surgery and the great benefit to the people and to the doctors, as a State hospital for the indigent crippled and deformed.

## LOOSE BODIES IN THE KNEE-JOINT.

BY MELVIN S. HENDERSON, M.D., ROCHESTER, MINN.

LOOSE bodies occur most frequently in the two large hinge-joints, namely the knee and the elbow. I shall consider here only those having as their habitat the knee-joint. Our lower limbs have to perform double functions; they must have strength to enable us to stand and they must allow locomotion. To permit of free and easy locomotion there are provided articulations complementary one to the other, and these articulations must be of mechanical construction capable of bearing the body-weight through many angles. The hip-joint is of a ball-and-socket construction, the muscles during locomotion giving aid to the stolidity beside that so adequately provided by the bony structure. The knee-joint is constructed so that the bony prominences aid but little in the stability, and the tendons of the muscles inserted in the immediate vicinity assist to a very slight degree. Consequently nature has been called upon to provide a most efficient ligamentous support for this hinge-joint. When certain ligaments are slackened by a given motion, other ligaments must give support during this motion. In spite of the excellent ligamentous support, there is present in the knee-joint during flexion a little abduction, adduction and rotation of the leg on the thigh. The maximum of these movements occurs in the arc between an angle of flexion of about  $30^{\circ}$  and an angle of flexion of  $90^{\circ}$ . This arc may be spoken of as the arc of weakness. Beyond  $90^{\circ}$  flexion the stability increases. It is in this arc of weakness that the vast majority of mechanical derangements of the knee are sustained. It must be remembered that the knee-joint is a comparatively superficial joint, and when in flexion direct trauma is very readily inflicted on the condylar surfaces of the femur.

The etiology of loose bodies is perhaps the most interesting side of the subject. The source of these bodies awakened the interest of John Hunter<sup>1</sup>, and his theory of their production, even if not correct, is interesting. He taught that blood when effused tended to organize and adapt itself to the tissues in which it was effused; thus if the effusion were in the abdomen a soft tumor resulted, or if in the neighborhood of a bone, a hard one resulted. He believed the organized clot in the knee attached itself to the articular cartilage, assumed its character, and later becoming detached, gave rise to cartilaginous bodies.

The symptoms are so well known and the diagnosis so simple usually that I shall merely mention them incidentally.

Probably the most logical classifications of loose bodies in the knee-joint are as follows:



1. Fibrinous loose bodies, intrinsic in origin.
2. Bodies composed of organized connective tissue, *e.g.* bone and cartilage, intrinsic in origin.
3. Loose foreign bodies, extrinsic in origin.

#### FIBRINOUS LOOSE BODIES.

The fibrinous loose bodies, described as corpora oryzoidea by Koenig<sup>2</sup>, are, as the name signifies, composed of fibrin. They consist of concentrically laminated masses of fibrin, and have been variously named according to their size, as melon-seeds, rice bodies, wafer bodies, etc. They are not confined to joints, for they are often seen in bursae and in tendon-sheaths, and are thought to be pathognomonic of tuberculosis. In joints they frequently occur in large numbers, and here again tuberculosis is usually thought to be their etiologic factor. This same fibrinous material of which they are composed is used to coat foreign bodies such as needle points, when the latter are free in the joint. Clinically they produce only slight symptoms. Usually the patient mentions some slight restriction of motion and stiffness. There is almost invariably an accompanying effusion of varying amount, and the bodies may be detected on palpation of the joint. They do not cause the mechanical inconvenience of locking or slipping, such as is produced by loose bodies of the organized connective tissue group. They are the result of some disease in the synovia, and in tuberculous joints are said to be produced by the extra amount of fibrin thrown out by the cells of the synovial membrane. The following history is typical of this group:

CASE 92315, S. H. D., male, aged 29, examined Sept. 18, 1913. For two years, following an indefinite sprain while working exposed to cold and wet, there had gradually developed a soreness and aching in the right knee. The extremes of motion were restricted, and all symptoms were worse on change of weather. Palpation of the joint revealed the presence of fluid and the semi-crepitant "feel" of rice bodies could be elicited. The roentgenogram showed merely synovial thickening. On September 28, 1913, the joint was explored and about 4 ounces of straw-colored fluid was aspirated and multiple rice bodies were removed. The joint was thoroughly irrigated with saline solution to remove as many of the rice bodies as possible and was then injected according to the method of Brackett, except that 2% formalin and glycerin was used instead of an iodoform suspension. The aspirated fluid was injected intraperitoneally in a guinea-pig with negative result. Two and a half years later the man wrote that the knee was much improved, though motion was still somewhat restricted. He had walked recently 15 miles in one day with no discomfort.



FIG. 1. (147988) Cross section of loose body, showing how cartilage has grown around the bone. Magnified two and one-half times.

#### BODIES COMPOSED OF ORGANIZED CONNECTIVE TISSUE.

These bodies form a large and interesting group. Their histologic structure is of interest, for they are usually spoken of as being cartilaginous. While cartilage is the main part of the body, yet frequently on section there will be seen a flake of bone. In my experience the majority of these bodies have arisen from the internal condylar surface of the femur. They come from the ridge of thick cartilage on the internal condyle provided to compensate for the wear caused by the hinge-like action of the joint. When a large piece of cartilage is chipped out from this area there is usually a small piece of the spongy bone from the epiphysis with it. The cavity left in the condylar surface, if small, fills in again with cartilage, but if large a scar is left which can be detected in the roentgenogram and at operation. The loose body wanders about the joint, and in some instances receives sufficient nourishment from the joint-fluid to increase its size; it becomes rounded until the bony part of the body is completely surrounded with cartilage (Fig. 1). The bodies may be further subdivided into (a) those having as their etiologic factor some disease such as osteoarthritis or Charcot's disease, and (b) those due to injury. The loose bodies due to disease and those due to injury are inseparable in certain cases; an osteophytic growth due to osteoarthritis may readily be loosened by joint-trauma, direct or indirect, and become a loose body.

It has long been recognized that osteoarthritis is the etiologic factor in the production of a considerable number of loose bodies. Loose bodies due to the disease are usually multiple in the individual joint. The inflammation due to the disease acts on the articular extremity of the bone and also involves the contiguous structures of the joint. There results an erosion and fibrillation of the cartilages and eburnation of the bones, with osteophytic growths, which break off and wander about the joint as loose bodies. By their wandering they produce further irritation, and locking of the joint is of frequent occurrence; the effusion is increased with consequent stretching of the synovial sac and its incorporated ligaments, thereby making the joint less stable. Other conditions being equal, the removal of these bodies when producing such symptoms, is essential for the comfort and safety of the patient. The following case is cited as illustrative of this group:

CASE 108373, Mrs. J. R. H., aged 60, examined March 17, 1914. History of rheumatism for 20 years, involving all joints and with slow changes in finger joints. Two and a half years before, on getting up from a chair she had a sudden sharp pain in the right knee so severe that she cried out. Swelling followed. One month later a definite locking occurred and this was repeated many times. The roentgenogram showed, in the hands and knee, typical osteoarthritic changes, with a body lying in the suprapatellar pouch. Apparently this loose piece of cartilage and bone originated in an osteophytic growth, which had broken off and later increased in size. June 30, 1914, the body, one and one-half by three-fourths by one-fourth inches, was removed through an incision just above and to the outer side of the knee. Relief of the locking followed, but stiffness and soreness, due to the arthritic condition, persist to date.

Occasionally associated with hypertrophic arthritis there is a loose body in the knee-joint that may be looked on as the cause of the arthritis rather than the result. The following case is an example.

CASE 135273, S. A. A., male, aged 52, examined July 8, 1915. Twenty-four years previous this patient sustained a severe trauma to the inner side of the right knee. One month after the accident locking occurred, and would recur many times a day. For 10 years this frequent locking was present, but disappeared when the body found a favorable resting place above the patella "out of the joint." Up to one year before our examination, he had no further trouble, though the body was always to be felt in the suprapatellar pouch. Without any direct trauma, though he had been subjected to extra exertion, the body slipped "into the joint" and the locking recurred. When able to keep the body above or to the inside



FIG. 2. (135273) Loose body in suprapatellar pouch and a smaller one in the posterior compartment.

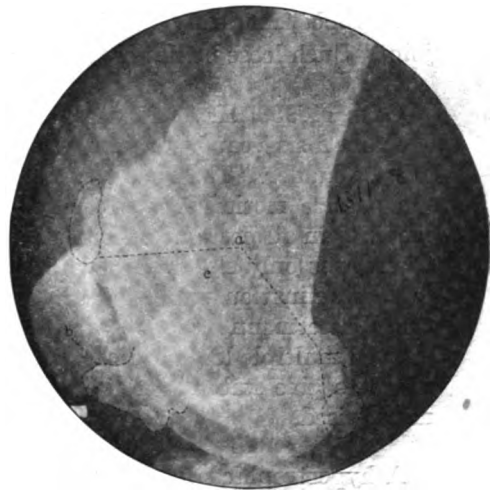


FIG. 3. (131188) (a) Multiple loose bodies, (b) exostosis, and (c) degenerative changes in the lower end of the femur.

of the patella, he was free from trouble. Physical examination did not disclose affections of any other joint. The roentgenogram of the knee showed hypertrophic arthritis, a calcified body posteriorly and a larger one in the suprapatellar pouch (Fig. 2). On July 16, 1915, under local anesthesia a large body one and one-half inches in circumference and about one-fourth inch thick, was removed from the suprapatellar pouch. The edges were rough and irregular. The patient's recovery was uneventful and complete.

Occasionally loose bodies are found in Charcot joints. It is necessary to emphasize that a Charcot joint is essentially a neuropathic joint, and only under unusual circumstances would operation be warranted. All too frequently these patients have been subjected to operation for the removal of a loose body when the body was entirely a secondary consideration. The patient, presenting himself with loose bodies in the knee-joint, who admits a syphilitic infection years before, should put us on our guard. As a rule, the patient with a Charcot joint tells us that the affected joint gradually becomes a little unstable and some slight soreness develops. A history of darting pains in the lower limbs can frequently be elicited, and a careful neurologic examination should be insisted on. Sensory disturbances, even though slight, are very important in the diagnosis. These findings, taken into consideration with the fact that we are dealing with a joint that is hypermobile and at the

same time practically painless, establishes the diagnosis of a Charcot joint. Such loose bodies are, then, only secondary considerations.

CASE 140939, H. G. C., male, aged 47, examined September 10, 1913. He gave a six-year history of weakness in the right knee, following a fall from a ladder. The knee was not subjected to a roentgen examination. On passive motion it was easily hyperextended, and there was lateral mobility in all positions. On walking there was marked outward bowing. There was only slight pain with soreness on excessive use. The neurologic examination was negative. No venereal history was admitted, but the Wassermann reaction was strongly positive. The roentgenogram showed multiple loose bodies and destructive arthritis. A brace was provided to give stability to the knee; the removal of the loose bodies was not advised.

A hypertrophied fat tag may cause mechanical inconvenience in the knee-joint. It is rather rare, though Painter and Erving<sup>3</sup> lay stress on the fact that it does at times cause restriction of motion and pain. I have rarely seen such a case. In our cases the fat tags have been secondary to chronic diseases, such as tuberculosis and syphilis. In none of this series have there been operations for the relief of such a condition *per se*.

Occasionally, in a joint with one or more large loose bodies, a rather interesting condition is seen. The synovia is thickened, congested and has little papillary outgrowths. Various stages in the growth of these papillary bodies can be seen; some are merely the pouching of a localized piece of synovial membrane, while others are pedunculated, though soft and of the consistency of the synovia. Others are fibrous or cartilaginous on the tips, and the pedunculation being more marked, only a slight trauma is necessary to detach one of them and produce a free fibrous or cartilaginous small body in the joint. These bodies may remain small, or, acquiring their nutrition from the joint-fluid, increase in size. Whitelocke<sup>4</sup> is of the opinion that these fibrous tags readily become cartilaginous, and are the loose cartilaginous bodies that so frequently produce symptoms. His theory is opposed to that of Koenig, but he lays particular stress on this point and argues it on embryologic grounds. He states that the development of fibrous tissue into cartilage is due to the fact that the early development of the synovial membrane, articular and interarticular cartilages of the knee-joint are all from the same primitive embryonic intermediate layer of the axial blastema. I can only say that I have but in one instance seen anything approaching this condition. The illustrative history of this patient is as follows:

CASE 131188, T. K., male, aged 40, examined May 7, 1915. Twenty-three years before, following a fall on the ice, the knee became swollen and painful. Recovery was complete, and for 17 years the man had absolutely no discomfort in his knee, then it began to swell a little after exertion. Various remedies, such as massage, blistering, and electricity were tried, with no relief, but he managed to carry on his work on a farm. The year preceding our examination the swelling and pain finally necessitated the abandonment of his work. No history of venereal infection could be elicited, and repeated Wassermann tests were negative. The roentgenogram showed multiple loose bodies in the knee-joint, the condylar outline rather hazy beneath the patella, and what appeared to be degenerative changes in the lower end of the femur (Fig. 3). The joint was explored by a median incision, splitting the patella. Multiple loose cartilaginous bodies were removed, the largest being one inch by one-fourth inch. The smaller ones appeared to have their origin in the synovial membrane. Little pouches of synovial membrane, varying in size from a pinhead to a small pea, protruded into the joint. Some of these were white and fibrous on their tips, others were becoming cartilaginous, and had small pedicles. An exostosis, about one-half inch in diameter, was removed from the external condyle. The exostosis evidently originated in the cavity left by the large body. Through a separate incision on the inner side of the knee, the degenerative condition of the lower end of the femur was explored. It was not vascular; a cartilaginous fibrous tissue was obtained, and on microscopic examination, was pronounced benign. No relief followed the operation. The patient returned four months later, with his knee much larger and motion greatly restricted. The roentgenogram showed that the apparent degeneration in the lower end of the femur was much more advanced. Amputation was done at the upper third of the thigh. Pathologic report: Chondro-sarcoma. The patient's general health declined, and two months later the roentgenogram showed metastases in the lungs.

#### LOOSE BODIES CAUSED BY INJURY.

The loose bodies caused by injury, either direct or indirect, are usually found in patients in the active period of life, who are exposed to the traumas incidental to athletics and open-air vocations. The production of loose bodies is often attended by so little trauma that we must look for some explanation other than trauma *per se*. Koenig<sup>7</sup> in 1887 first described osteochondritis dissecans. More recently Freiberg<sup>8</sup> and Ridlon<sup>9</sup> have called our attention to this condition. Such cases, as these authorities have described, account to a large extent for the group of loose bodies, in which there are inconsequential histories of trauma. It is



FIG. 4. (148865) Flattened area on the internal condyle, from which the loose body arose. The loose body was to the inner side of the patella.



FIG. 5. (148865) Loose body left knee suprapatellar pouch.

thought better to group these under the head of injury rather than disease, though there are arguments for their inclusion under the latter. A comparatively slight trauma might produce a loose body in a person affected with osteochondritis dissecans, whereas the same trauma in a normal person would not be productive of trouble. Osteochondritis dissecans is probably not so exceedingly rare as was at first believed, and the theory of Koenig accounts, more or less satisfactorily, for the production of these bodies, but leaves us in the dark as to why this pathologic process should occur. His theory is based on the fact that arteries supplying the contiguous joint-surfaces of the femur and tibia are end arteries, and that a blockage or failure to act on the part of one of these arterioles shuts off the nourishment to a certain localized area. This devitalized area then becomes separated, and may by a direct injury, or even the normal action of the joint, be cast off as a free body, or the fragment may hang by a fibrous pedicle. We occasionally see persons who have had "joint mice" removed from both knees. The following case history is illustrative of osteochondritis dissecans in both knees.

CASE 148865, A. Q. A., male, aged 34, examined December 30, 1915. One year before, this man's left knee locked when swinging himself around a newel post on going down stairs. A few weeks later a loose cartilaginous body was removed from the suprapatellar pouch, with relief of all symptoms. Two weeks previous to our examination, he twisted his right knee slightly in getting off a train; locking occurred, followed by pain and swelling, necessitating rest in bed for a few days. Roentgenogram (Fig. 4) of the right knee showed an eroded area on the internal condyle, and a loose body. The loose body was removed (osteocartilaginous) by splitting the patella. While convalescing, the patient located a loose body in the left knee. This was removed under local anesthesia. Roentgenogram (Fig. 5) of the suprapatellar pouch showed a loose body, evidently having its origin from the internal condyle. There was no history of trauma, direct or indirect, to the left knee, since the first body was removed from it the year before. If produced at the same time as the first body it must have been resting quietly in some pouch, for there were no symptoms.

Occasionally a person apparently in perfect health may, on strenuous, yet not unusual, exertion for that person, produce a loose body in the knee-joint. There is in this type no history of direct trauma, and any injury to the articular cartilages must have been produced by intrinsic trauma. We can explain the production of damage to the semilunar cartilages by the normal, and at times, hazardous, mobility allowed these cartilages and the hinge-like action of the joint on them; but the smooth surface of the articular cartilage should not produce on the other articular surface an injury severe enough to devitalize an area and to cause its desiccation. It is possible that the semilunar cartilages may themselves have withstood the applied force, due to their fibro-cartilaginous structure, but this same force applied through them may have inflicted upon the more brittle osteocartilaginous surface an injury sufficient to chip a piece off or to devitalize it so that, in the course of a few weeks, the bruised area may be thrown off as a loose body. The following case would fall under osteochondritis dissecans, and is an example of the condition in a single joint.

CASE 112029, I. B. H., male, aged 23, examined August 3, 1914. This man complained of his right knee; inability of complete extension. There was some swelling. The onset occurred one month before, on arising from sitting "tailor fashion." He felt a slight pain, especially in the posterior part of the joint, and could not completely extend the leg. From that time on he had a feeling of "things not being right" in the joint.





FIG. 6. (112029) Loose body intercondylar space.



FIG. 7. (112029) Area on internal condyle, the origin of the loose body.

There was at no time typical locking. The roentgenogram (Fig. 6) showed a loose body in the intercondylar area. It was apparently between the condyles, and seemed to have come from a spot on the internal condyle of the femur. On exploring the joint the body was found lying between the condyles of the femur. The area from which it came on the internal condyle (Fig. 7) was plainly evident. The patient's recovery is complete.

The story of direct trauma may be so definite that we cannot doubt the loose body originated in the devitalized area, caused by the injury. Falling on the bended knees and striking on a hard object is a common cause of direct trauma inflicted on the cartilaginous surface of the femoral condyles. Loose bodies have been reported arising from the tibial articular surface, but I have as yet to see this origin.

CASE 142135, W. D. H., male, aged 38, examined September 27, 1915 Disability in left knee. Four months previous, the man jumped over a fence and, swinging to the left as he fell, struck on his left knee in the flexed position. On getting up he walked with great difficulty; and the next day took to his bed. The leg was flexed to a right angle, but in

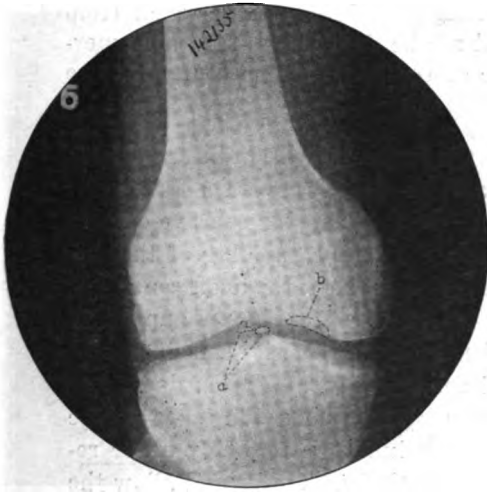


FIG. 8. (142135) (a) Two shadows loose bodies intercondylar space. (b) Area on internal condyle disclosed the source.



FIG. 9. (128776) Loose body with a twelve-year history of locking.

10 days, under extension, the knee gradually straightened. Swelling was marked. Extension was maintained for nine weeks, and casts within two days of the time of our examination. He had a feeling as though there was something out of place in the joint. He was able to completely extend and flex to a right angle. Swelling was still present. The roentgenogram (Fig. 8) shows loose bodies in the joint, probably two, in the intercondylar space. They were quite dense, and a flattened area was noted on the internal condylar surface, apparently the source of the loose bodies. On October 13, 1915, the patella was split longitudinally and 2 loose bodies were found, one 2 centimetres in diameter in the suprapatellar pouch, and another about 3 centimetres in diameter between the condyles. The internal condyle was flattened over an area about the size of the large, loose body, showing clearly the source of this body.

The following history shows how long some patients endure the presence of these bodies, with no harm to the joint.

CASE 128776, C. A. E., male, aged 29, examined April 26, 1915. Twelve years ago he fell, striking his flexed left knee on the edge of a wagon box. No very appreciable swelling followed, and he was able to go about his duties. Soon after this locking occurred, and has continued to date. The man estimated that there had been more than 100 lockings, appreciable swelling seldom being a sequela. He occasionally felt a loose body, to the inner side of the patella or above it. The roentgenogram (Fig. 9) showed a loose body just posterior to the patella. On April 29,

1915, under local anesthesia, the cartilaginous body was removed from beneath the patella. The origin could not be determined, and no hypertrophic arthritis was evident in spite of the long residence of the loose body in the knee-joint.

Damage to one of the fibro-cartilaginous menisci in the knee may be productive of a loose body, and occasionally even a free body. The structure of these menisci is such that the inner or concave edge is thinned out and is practically pure cartilage. Any pinching of the cartilaginous rim might readily cause a piece to be thrown off as a free body, to float at will about the joint. A continuance of force applied to the semilunar cartilage, after it had been ripped from its attachment to the lateral wall of the joint sac, could very readily, and often does, produce a fracture with destruction of the cartilaginous substance at the line of fracture. This cartilage in the semilunars is probably never replaced by true cartilage, but only by fibrous tissue. This would allow the portion of the meniscus which is torn from its attachment to the head of the tibia and lateral ligaments, to hang as a loose pedunculated body. Its mobility would vary according to the length of the pedicle.

CASE 129764, J. C., male, aged 36, examined April 28, 1915. This man came to the clinic on account of frequent locking of the left knee for the past 18 months. He had been thrown on a pile of stones from his wagon by a runaway team of oxen. Locking occurred at once, and great swelling followed. He had practically full motion at the time of our examination, but a little swelling was present, the last locking having occurred six days before. The roentgenogram was negative. Exploration of the joint by the condylar incision showed a partially fractured loose internal semilunar cartilage, also a small free piece of cartilage which had been torn off the inner margin of the internal semilunar cartilage. Recovery uneventful.

CASE 151787, H. G. A., male, aged 22, examined February 9, 1916. Six years before, he injured his knee playing football. Frequent catches and lockings to date. At times he felt a small movable body on inner side of knee. Locking occurred during examination and the body could be felt. The roentgenogram was negative. On February 11, 1916, the joint was opened and a fractured internal semilunar cartilage was disclosed. The anterior half was greatly atrophied and hung into the joint as a fibro-cartilaginous band—a distinct pedunculated loose body.

#### LOOSE FOREIGN BODIES.

Loose bodies, extrinsic in origin, are occasionally introduced, either



FIG. 10. (77702) Bullet in posterior compartment. It later moved to the center of the joint.



FIG. 11. (146719) Needle imbedded in internal condylar cartilage.

accidentally or intentionally, into the knee-joint. They may, and usually do, produce infection, with the disastrous sequelae so well illustrated by the reports that are emanating from the hospitals caring for the wounded of the present European conflict. In striking contrast are the cases we see in civil practice, in which the foreign bodies are occasionally remarkably well tolerated by the joint. Their presence is, of course, sufficient indication for their removal, unless very unusual circumstances contraindicate the procedure.

CASE 77702, R. K., male aged 10, examined December 26, 1912. Five weeks previous the boy was accidentally shot with a No. 22 bullet, on the external surface of the right knee. Marked swelling followed, but there were no constitutional symptoms. Many times the boy was able to definitely locate the bullet on the inner side of the knee, but it always quickly disappeared on slight manipulation. The removal of the bullet had been attempted at his home, but it could not be located, and the search was abandoned. The roentgenogram (Fig. 10) showed the bullet in the posterior compartment of the knee, but later it moved, until, at the time of our exploration, it was in the middle of the joint. On December 28, 1912, the joint was opened and the bullet, coated with fibrin, removed. Recovery uneventful.

CASE 55693, L. G., female, aged 10, examined July 10, 1911. Six days previous she knelt on a rug, and the head of a needle, with about one inch

of the shaft, penetrated the knee-joint. No constitutional symptoms or marked local symptoms followed. The roentgenogram showed the needle lying, apparently, on the internal tuberosity of the tibia. Movements of the right knee were painful, the knee being held stiff. There was a little swelling. On July 15 the knee-joint was opened by following the scar of entry of the needle. The needle, coated with fibrin, was easily removed.

CASE 146719, G. S., male, aged eight, examined Nov. 29, 1915. Three weeks previous the boy drew a piece of a needle out of the front and inner side of left knee. He did not remember the needle entering his knee, and the first thing he noticed was the piece of needle sticking out through the skin. The knee gradually swelled, became sore and ached, particularly at night. There was some slight limitation of motion, and the boy limped. The roentgenogram (Fig. 11) showed a piece of the needle evidently imbedded in the inner condyle, about the level of the lower end of the patella. On December 3, 1915, the joint was opened by an internal incision. A little flake of fibrin was plugging the hole of entry in the cartilaginous surface of the internal condyle. It was necessary to chisel off a little of the cartilage before the piece of needle could be removed. Recovery was uneventful; the knee is normal.

#### TECHNIC.

As in all joint-surgery, the most rigid asepsis is essential, and must be available before these bodies are molested. The occasional removal under local anesthesia, in the consultant's office or in the home, even though successful, is to be condemned. If the body can be located and held in place by the sterile gloved hand or by a transfixing needle, the removal can be quickly accomplished under local anesthesia. Unfortunately this cannot always be done, and then a general anesthetic should be given, and the incision used which offers the easiest approach to the body. This may be made laterally on either side or by splitting the patella. The latter incision is not a suitable one for routine knee-surgery, for through it the removal of a semilunar cartilage is difficult. The condylar incision is better for removal of the meniscus. Bodies intrinsic in origin of any size, in the posterior part of the joint, rarely demand removal, but when necessary the incision described by Brackett and Osgood<sup>7</sup> is the best. Bodies extrinsic in origin in this situation had better be removed, even if too large to find their way into the anterior compartment. If the body eludes the surgeon, although an embarrassing occurrence, a second attempt, at a more opportune time, is better than a too prolonged search, necessitating considerable manipulation and



FIG. 12. (97040) (a) Loose body removed at first operation. (b) Two months after removal of first body, this loose body migrated from the posterior compartment and caused symptoms necessitating its removal from the suprapatellar pouch.

trauma, thereby increasing the risk of infection. The fingers should not be introduced into the joint for exploration. The following history demonstrates how it is occasionally necessary to subject the patient to two operations.

CASE 97040, F. M. K., male, aged 28, examined December 12, 1913. There was a history of typical locking for 20 years, following direct trauma to the inner side of the right knee. Effusion never completely subsided. The roentgenograms showed two loose bodies in the joint. Operation, December 18, 1913. An incision was made and a loose cartilaginous body a little more than 2 centimetres in diameter was removed. The other body could not be located, and it was thought probable that it had gone to the posterior compartment of the joint. The effusion and locking persisted, and a roentgenogram two months later showed the second body in the suprapatellar pouch. April 30, 1914, the joint was again opened through the old incision, and a piece of cartilage about  $2\frac{1}{2}$  centimetres was removed. The internal semilunar was normal, and was not removed. Recovery complete and permanent.

In cases of disability, the fact that but one loose body is found should not preclude a judicial exploration of the joint. A very careful study of the roentgenogram is imperative before operating, and the plate should be at hand during the operation. A faint shadow noticed at some spot away from the apparently main offender should be, if practicable, carefully investigated when the joint is open.

#### CONCLUSIONS.

1. Fibrinous loose bodies are due to some disease condition of the joint, and do not cause mechanical derangements.
2. Organized connective tissue loose bodies produce mechanical derangements.
3. Loose bodies may have as their primary cause some condition, such as osteoarthritis or Charcot's disease, but the secondary cause is direct or indirect trauma.
4. Osteochondritis dissecans is a group standing more or less distinctly out from the rest. The bodies seem to be produced by very slight indirect trauma. It is, however, difficult to estimate the degree of indirect trauma, and for that reason they had better be considered as due to trauma rather than to an actual disease.
5. Trauma, direct or indirect, is essential to the production of a loose body.
6. Surgery offers the only permanent relief, and the general condition of the patient being satisfactory, the bodies should be removed.

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# DISSERTATION ON THE EFFECTS OF MOTION AND REST IN SURGICAL DISEASES.

BY JEAN-PIERRE DAVID.

The Subject Proposed for the Prize, by the Royal Academy of Surgery, at Paris,  
for the Year 1778.

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To explain the effects of motion and rest, and the indications according to which the use of either should be prescribed in surgical diseases.

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It seldom happens, however, that inaction alone, even though continued for a considerable length of time, can produce this disease. The most usual causes are: the diseased states of the bones, either on their articular surfaces, or in the neighborhood of the articulations; the inflammation and tension of the ligaments that strengthen them; and the muscular aponuroses that cover them. It may be observed, indeed, that in the diseased state of the articular surfaces of the bones, the anchyloses may frequently be considered as the resource of Nature for the preservation of a limb she is not willing to lose; and in these cases we ought to be so far from resisting the progress of the disease, that our art must be exerted in encouraging it by every possible means. It may here well be presumed that motion is not to be employed to bring about this salutary end, as I shall shew hereafter, when I shall expose the indications which direct the use of rest in surgical complaints.

The effects of rest and motion being, as we have observed in the first part of this essay, as diametrically opposite as their causes, and the too great inspissation of our fluids affording us a precise indication for the employment of motion, we might immediately conclude from hence, that whenever it becomes necessary, in the cure of surgical complaints, to increase the thickness of these same fluids, or any of them, it will be proper to call in the assistance of rest. This is a very natural consequence, which should seem to point out both the causes which require the use of this method, and the indications which are to lead us in prescribing it.

But in order that this consequence may be admitted, it becomes necessary to support it by facts, which present themselves in great numbers. In all fractures, for instance, where the advantages of rest are so evident, nature seems to require nothing but an inspissation of some of our liquids. Is it not by the gradual concretion of a juice originally fluid, that she unites in the most solid manner, the bony parts that have suffered solution of continuity? Is not this desired effect chiefly brought about by rest, and doth not motion put the greatest impediment to it? This circumstance is universally known, and not contradicted by any



fact; but there are many other cases in which nature appears to have the same views as in fractures, and in which the indications for rest are as precise as in these accidents. These cases, though not infrequent, require a degree of attention and penetration to distinguish them, and it is by taking a view of them, that we shall find rest to be frequently the most certain method that art can furnish the surgeon who knows how to apply it.

In my first anatomical pursuits, I had seen some spines of crooked persons that presented three or four dorsal vertebrae, the bodies of which were soldered and confounded together, without having paid any particular attention to this disease, and without having reflected on the accidents it might have produced during its continuance. But a patient whom I saw at the Hospital in 1766, fixed my observation upon this subject. Having been violently beaten, at the age of thirteen, by his father, he felt, a few months after, a weakness in the spine, attended with pain and a difficulty of keeping an upright posture. He at first walked with great difficulty, and afterwards could not walk without leaning upon a stick, with his body bent forwards. These first symptoms, which continued more than six months, were followed by a fever, accompanied with difficulty of breathing, and pain in the middle of the back, without any apparent swelling externally. These symptoms were relieved by bleeding and other remedies, and the patient seemed restored to his former state; but the difficulty of walking and of supporting himself increased by degrees, and at length a tumor was formed towards the lateral and posterior part of the last false ribs, the increase of which was very slow, and made no change in the color of the skin. This tumor, extending itself, gained the region of the loins, and more than six months after its appearance, the skin became inflamed, grew thin, and by the assistance of maturing poultices applied to the tumor, a fistulous opening was made in it, from whence issued, according to the patient's account, more than a quart of matter as white as milk. This discharge having continued very plentiful for three months without hopes of cure, the parents, tired with the length of the disease, took the resolution of sending this young lad to the Hospital. When he came there he had a fistulous opening on the right side of the lumbar region, which furnished an ichorous and plentiful discharge; a slow suppuratory fever accompanied, and every appearance seemed to shew that death would soon terminate this disorder. A pledgit of soft ointment only was put upon the fistulous orifice, and the disease was left to nature. I frequently saw this patient, who being better fed, and more attended to than at home, began to recover a little from the deplorable state to which he had been reduced. He, particularly, kept very quiet in bed, and his spine was then incur-

vated with an evident projection outwards, towards the last dorsal vertebra. About two months after he came to the Hospital, the matter which oozed from his fistulous opening, grew thicker and less plentiful, the countenance appeared better, the pulse less frequent, and he began to give some hope of recovery. This hope was more confirmed six weeks after, for the discharge was still lessened, and the patient began to feel some degree of strength in his spine. Two months after this last period, the fistulous orifice closed, and the patient began to walk with a stick; but he was crooked, and seemed to have lost much of his former height.

From the accident this patient had undergone, and the deformity of the spine he had contracted during the course of the disease, I imagined that some of the dorsal vertebræ had been affected with caries; that the remains of them, after being confounded together and after having been in a state of granulation, had at length acquired a degree of solidity sufficient in some sort to supply the bodies of these bones. I could not but consider rest as having been the chief promoter of this salutary end; and subsequent facts appear to have completely confirmed my conjectures on this point. First, the patient who had been the subject of the preceding observation, and whom I had always kept within my notice, having been seized in 1769 with a peripneumonia, of which he died, I was allowed to inspect the body, and my first care was to take notice of the disorders the spine had experienced three years before. I found, as I suspected, several vertebræ the bodies of which were confounded with each other; these were the ninth, tenth, and eleventh of the dorsal vertebrae, which had lost at least half of their longitudinal dimensions, while their spinal processes, which had not suffered the least alteration, formed a projection and a remarkable convexity outwards. This first part of my conjectures being verified, I have neglected no opportunity of informing myself what share rest might have had in these sort of cures. Accordingly, I have questioned all deformed persons, whenever I could do it with propriety, and desired them to give me an account of the accidents that had happened to their spines previous to its deformity. Those who are become so merely from a lateral projection of this column, without having had any collection of matter during the growth of this projection, or after it was formed, have scarcely complained of anything more than a gradual weakness of the part affected, and have never been obliged to keep from motion entirely. They have almost all been able to rise out of bed at all times, and even to walk with a stick without experiencing any very acute pains. But those in whom marks of former abscesses were to be observed, who in some small part of the spine have an evident projection and convexity outwards, have all been obliged to keep their beds for several months, sometimes for whole

years; and it was never till after a long-continued rest that the spine began to recover, at the part affected, a sufficient degree of solidity to allow them to support themselves and to walk.

If rest, such as it might be, without being subjected to any rule, hath produced good effects in these cases, we may readily conceive that it would have been attended with much greater advantage had it been prescribed and employed with discernment. Still, however, this kind of disease presents us with precise indications to determine the use of it. It may even be presumed that it would prove one of the most certain means that could be employed to prevent deformities of the spine, for it is not at the time this column discovers a tendency to projection that we ought to leave it oppressed by the weight of the superior parts which it should naturally sustain. We should wait, till by rest and a horizontal position. the pieces that composed the column shall have lost, by the use of proper remedies, that morbid state of softness which had disposed them to be thrown out. These two means, rest and horizontal posture, are equally indicated whether the progress of the disorder be assisted by a weakness of the ligaments connecting the vertebræ, or by the action of the muscles. But these unions of the vertebræ after a greater or less destruction of their bodies, which we have observed to happen in the dorsal vertebrae, may also take place in the lumbar vertebræ; and might not rest contribute to effect this salutary purpose in cases of caries, with which the vertebræ of the loins are so frequently affected? Let us consult facts, that we may know how far this remedy is to be depended upon in the cure of so terrible a disease.

I have seen many of these carious vertebræ, and the death of all those who have been attacked with them, seems to proclaim that they are an incurable complaint. But before we lay down this dreadful prognostic, let us trace the disease throughout its progress, and let us consider the phenomena it presents to us during its long continuance; these may suggest some ideas from whence a more comfortable prognostic may be deduced, and which future facts may perhaps justify. We frequently see after a fall on the buttocks which shall have occasioned a concussion in the lumbar vertebræ, after a blow received on these parts, after a violent and painful effort made to raise too heavy a load, etc., after such accidents, I say, we frequently see that the persons who have suffered them, complain, sometime after, of a dull pain in the region of the loins, with a difficulty of walking, which, increasing gradually, without ever causing any very acute pain, ends, at length, in so great a weakness of the spine that they are no longer able to support themselves, and are obliged to keep in bed. At this period, which is often nine or ten months after the accident, we generally begin to perceive a tumor, which makes

appearance either underneath Poupart's ligament or on the side of the great ischiatic foramen, and which increases slowly, without being painful to the touch.

When the tumor hath acquired a certain size, and that the matter which forms it is sufficiently advanced towards the skin, a manifest fluctuation is observed in it, which seems to furnish a positive indication for the opening of it.

The surgeon who makes this opening and who sees that he has given issue to a great quantity of matter, confined for a long time in swellings of this kind, congratulates himself upon an event which he thinks cannot but turn out for the good of his patient; but the patient, who for some months past had experienced no evident degree of fever, who suffered but little, who had perhaps preserved his appetite, who slept, and who had complained of no other symptom but that he could not keep his back upright, is far from being relieved by this operation, at least if he be, the relief is not of long continuance; for the matter forming the tumor, which at the time of the opening was white as milk and without smell, soon contracts a considerable stench, a fever comes on, the pulse becomes quick and small, and the patients pretty frequently die towards the thirteenth day.

The body is afterwards opened, when a caries of two or three of the lumbar vertebræ, and often of part of the os-sacrum, presents itself to the view; and after this discovery, the surgeon is far from imputing to his own management the speedy death of the patient.\*

It is proper, however, to observe, that this patient had lived several months, without any considerable inconvenience, with this caries, and with this tumor though it contained a large collection of matter; his state would not even have been changed so suddenly if an opening had not been too precipitately made. We shall be convinced of this by attending to what happens when these tumors are left to nature; if they burst, the opening is made much later, and it is only at this period that patients are seized with any alarming symptom, and that too in a much less degree than after the opening has been made by art. The reason of this is certainly because nature procures no more than a very small issue to the matter. If the patients then die; they perish much later than in the other instance. This difference in the event teaches us at least that we must not meddle with these tumors, that we must apply nothing to them to hasten their opening, since nature appears to disapprove of their bursting, as a termination that is not usually according to her wishes.

\* Many of these and subsequent observations have been adopted by Mr. Justamond, in his essay on abscesses, as containing that gentleman's entire sentiments on the subject.

But here someone perhaps may say that a disease of so terrible a kind is beyond the resources of art and the efforts of nature. Let us beware of deciding this matter so lightly; and of assigning limits to nature which she hath not prescribed to herself; for since we have instances of caries of the dorsal vertebræ cured by her assistance alone, why should not her power be extended to the cure of caries of the lumbar vertebræ, if her operations were not disturbed by improper measures? At least the following is a fact which seems to prove that this disease is not beyond her power of relief.

A young woman of twenty-two years of age, after having fallen on the bottom of her back, down a staircase, felt, for a considerable while, a pain, more or less acute, in the region of her loins, and was seized with a gradual weakness in that part, which in a short time, prevented her from walking, and even from supporting herself; at which period, she applied to me. Revolving in my mind these symptoms and the cause that had produced them, I imagined her case to be a disease of the lumbar vertebræ, and the best means to cure that could be prescribed were rest, and lying abed. I explained to her the imminent danger of her situation, and engaged her punctually to follow my advice. This she did very exactly, by going to bed and remaining there constantly, taking care to exert as little motion as possible, agreeable to what I had recommended. Notwithstanding these precautions, the disease continued to advance; the weakness of the loins, and the pain she felt there upon motion, were accompanied with a tumor that began to make its appearance under Poupart's ligament, which became in process of time, as large as one's fist, and which at length discovered an evident fluctuation. Warned by the melancholy end of all those in whom such tumors had been opened, I carefully avoided applying anything that might hasten the bursting of it, and abstained still more religiously from opening it with a cutting instrument. This tumor, with fluctuation, after having acquired its full size, remained nearly in the same state during four months, and at that period began to be imperceptibly dissipated, so that in four months afterwards there remained not the least vestige of it; the patient felt from one week to another, that the spine was recovering its former strength; she began to sit upright in her bed, while her back was supported; she made a shift to walk with a stick, and was at length capable of walking alone and unsupported with as much firmness and confidence as ever; but the happy termination of this disease was owing to her persevering for near a twelvemonth in keeping her bed, and in a state of rest.

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But however advantageous rest may be, however pointed may be the

indications for it in the instances before mentioned, there are still other cases of caries in which this indication is more precise, and less liable to be mistaken, than in those of the dorsal and lumbar vertebræ; these are the caries affecting the joints. The ligaments, or the articulating surfaces of the bones, often suffer injuries in their organization, which cannot be removed by the usual remedies employed in the beginning, in cases of concussions, wounds, fractures, etc.; or where these injuries arise from a fault in the habit, they oftentimes will not yield to the remedies proper to resist the action of any acrid irritating principle that may have been fixed upon these parts.

In these instances nature, who always tends towards a cure, hath a very great labour to perform, in the prosecution of which we must be careful not to disturb her by any indiscreet manoeuvres; in order that this labour may turn to the advantage of the patient, nothing is required but time and rest. Here, as in the other cases, nature avails herself of the usual resources; she forms pus, by means of which fluid she separates from the whole, the bony, ligamentous, and cartilaginous parts that are vitiated, from whatever cause; and she deposits, in the cavity of the joint, these fragments, together with the pus that has separated and conveyed them there. This pus, having employed more or less time in melting down these fragments, might possibly, as in the instance above cited, be re-absorbed into the general mass without inconvenience.

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It is plain, however, that during a work so long continued, and so prudently directed, nature must have been in particular want of rest in the part where she was carrying on these operations, and that motion could only interrupt and trouble them. But if rest have been hitherto useful, it is no less necessary to conduct a cure, so happily and so wisely begun, to its end; for the bony and cartilaginous surfaces being now disengaged from all the fragments nature hath chosen to separate, presents us with lively and ashy granulations, which are in that state of inflammation proper to contract an adhesion with cartilaginous granulations of the same kind. This adhesion consolidates itself by degrees, and forms at length a complete union between the bony surfaces, designed originally to move one over the other. But in order to obtain this salutary ankylosis, nature requires rest, and rest continued with the greatest perseverance.

In this great and admirable operation, she hath lost nothing but motion; and by this indispensable sacrifice, she has preserved a limb with part of its functions, and prevented the mutilation of the machine.

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Dressings seldom, very seldom, renewed, and an attention to place the

limb—at rest between junks, as in fractures, have been the only means employed. I might possibly have obtained the same termination in a caries, with an abscess, in the articulation of the os-humeri with the scapula, had I not yielded to the temptation of giving vent to a large collection of matter that began to shew itself by an evident fluctuation. But at that time I had not been sufficiently informed by my own mistakes. The event was fatal to the patient, who died of a suppuratory fever, after having fallen into a marasmus; and though on examining the part, I found a caries of the head of the os-humeri, and of the glenoide cavity of the scapula, a disease hitherto deemed incurable, I have not been the less persuaded since, that the operation I had performed, if it had not immediately caused, had at least hastened the death of him whom I had been intended to relieve.

Some subsequent facts have entirely confirmed me in this opinion. A man about fifty years of age applied to me in 1770, with the bones of the wrist so carious, that in two or three places one might pass a probe through them, by following some fistulous openings that presented themselves on the outside. The wrist and the hand, which were cedematous, considerably swelled, and of a dark blue colour, seemed to require amputation so much the more urgently, as the patient was tormented with a slow suppuratory fever; it was even the advice of a man very skilful in the profession, not to defer having recourse to this last resource. Notwithstanding this, I ventured to temporize, and after having applied the usual dressings for two days, I carefully closed all the fistulous openings with dressings that were not irritating, and the hand and wrist being covered with compresses dipt in a balsamic and spiritous embrocation, made with the yolk of an egg, oil of roses, and brandy, I placed them in junks. The parts being thus kept in a perfect and constant state of rest, I made no scruple of leaving the first dressings on for ten days without a renewal, more especially as neither the pain nor the discharge required them to be removed sooner; and at this time, it was curiosity, rather than any absolute necessity, that was the motive of my doing it. As I found the discharge less in quantity, thicker, and less fetid than when the patient was dressed every day, I judged it proper to put off the removal of the second dressings for twenty days; and at this period the swelling of the hand and wrist were half reduced, and everything seemed to bespeak, as much from the patient's countenance and pulse, as from the nature of the discharge, that hopes might already be entertained of a fortunate termination of this dreadful disease. In about two months and a half after this, these hopes were completely realized; for at this time all the fistulous orifices were perfectly cicatrized, and the cure was terminated, with no other inconvenience to the patient, except loss of

motion in the wrist, which has not since prevented him from doing his usual work.

But what absolute rest and unfrequent dressings have effected in combination with nature in the instances just mentioned, they have also done under my inspection, in two cases of caries of the articulation of the arm with the forearm. One of the patients in whom this disease had come on after fracture, with splinters and abscess in the joint, had even been sent to me in order that I might amputate the limb; the surgeon who had taken care of him for several months past judging there was no other way of putting a stop to the symptoms which attended this caries. And, indeed, a very considerable and œdematous swelling of the elbow joint and neighboring parts, a plentiful and offensive discharge, a total loss of appetite, a slow and suppuratory fever, two fistulous openings that penetrated into the cavity of the joint, and through which a probe being introduced, discovered a very extensive caries, were all symptoms sufficient to justify the operation.

Yet in this case, dangerous as it was, a few months of total rest, joined to long intervals between the dressings, having assisted the salutary formation of an ankylosis intended by nature, have made all the symptoms disappear, and have effected a perfect cure of this disease, with no other loss than that of the motion of the joint.

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We ought then to rely upon rest the more as it cannot be supplied by anything else; for all that art should attempt, is only to mitigate the pain, to assuage the irritation and tension of the parts, and to prevent inflammation and the fatal suppuration it may occasion.

Now, amidst all the methods that art can suggest to counteract these effects, rest is the most powerful; bleeding, diet, and external applications being only accessory helps, the efficacy of which is so much the more evident as they are combined with the principal agent.

But supposing that these means should have been neglected in the first instance, or that notwithstanding the application of them, abscesses should be formed in the cavities of the joints, and that the surface of the bones designed for their motion should be affected with caries; rest, at this period, and in the subsequent treatment of the disease, as we have before proved, is one of the chief methods of cure corresponding to the views of nature.

JEAN-PIERRE DAVID. *Dessertation sur les effets du mouvement et du repos dans les maladies chirurgicales.* xii, 164 p., 12°. Paris, Vve. Vallat-La-Chapelle, 1779. (Book quoted in Cat. of Surgeon-General's Office.) (Author's dates: 1737-1784.)

NOTE.—Copy made by John Ridlon, February 27th, 1916, from a writer's copy made in Liverpool, Eng., in 1890.



## RESULTS OF FRACTURE OF THE OS CALCIS.

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FOR the purpose of this present paper, an attempt was made to look up end-results in a series of unselected cases. Accordingly the names and addresses of patients entered in the hospital records as os calcis fractures, from July, 1912, to the end of the year 1914, were listed, and an attempt was made to look them up and ascertain the end-results, irrespective of the mode of treatment. With a few other cases, derived from private sources, a total of 75 such injuries were looked into.

Generally speaking, the lesions average up pretty closely. What we see are *smashes* of the os calcis received in falls on one or both heels, from a height of from 5 to 8 feet up to 30 to 40 feet. The lines of fracture, as sketched by the x-rays, are *not* uniform. In general, there is a smash below the weight-bearing vertical line of the tibia, running more or less (mostly less) vertically, and various radiating lines running down and forward, and backward. The heel is driven up and often is driven outward. The whole bone is compressed vertically and expanded laterally; there is often a pushing of fragments inward, under the ankle, and almost uniformly a considerable pushing outward of bone-fragments, capped by the usually intact outer lamella of the calcis out under the external malleolus. This is *the* type lesion.

There are four other types described:

1. The avulsion of a bit of the os calcis torn loose by the calf muscles and tendo Achillis. I know of two such cases (recent); one at the Massachusetts General Hospital and one at the Boston City Hospital. There are none such in our present series.

2. Fracture of the sustentaculum tali. This lesion has a classical German description by Abel; I know nothing of it.

3. Crushing fracture from lateral pressure. In our series, there are three such cases, and I have seen no other. Lesions so produced have no bearing on what we are now considering.

4. Escalator or machine accidents; particularly since we have had escalators, heels have come to be bitten off. Such cases are very real fractures, of course, but are *sui generis*, and do not concern the general question of calcis fractures. In our list there are two such cases.

This cuts out five cases.

In three of our list we do not believe there was any fracture of the

heel bone; one case we know to have died; in four cases the patients have definitely disappeared and cannot be traced in the "City Wilderness" of the South End; seventeen more we have not yet found; twelve others are too recent for estimation; sixteen have been traced and the sketch histories follow. Additional cases "met up with" more or less by accident, during this search, partly private cases and partly injured working men, sent to us for impartial examination by the State Industrial Accident Board, are also included, in a separate list.

In looking up these cases, no discrimination was made as to the treatment employed, though we have our own idea as to this.

The general drift of conclusions to be drawn is, beyond doubt, that expressed in the paper of Cotton and Wilson\*; namely, that os calcis fracture of the usual compression type, is one of the most serious lesions met with, so far as future function is concerned. Look at the lists below and see how few of the injured return to normal function or near enough to normal to earn their normal wage.

It is not unfair to say that all that stands in the accepted text-books about this lesion is utterly wrong!

Os calcis fracture is of as serious prognosis (not as to life, but as to use) as fracture of the femur at the hip. Ordinarily speaking, the man who breaks his heel-bone is "done," so far as his industrial future is concerned.

Late operations for correction are useful, but far from ideal in results; palliatives (plates, pads, braces and shoe modifications) are usually useless.

It comes to this: these fractures cripple,

1. By driving the heel up and out.
2. By producing flattening of the sole with fragment pressure on the structures of the sole.
3. By heaping-up bone in contact, beneath, with the external malleolus.
4. By damage, direct or indirect, to the joints between astragalus and calcis, that provide for the very essential motions of pronation and supination.

The present sketch illustrates how bad the results of conservative treatment may be. Something better must become our routine treatment.

We believe the results of the radical treatment proposed in the Cotton-Wilson article, offer a solution, useful, if not final, of the problem involved.

\* Cotton and Wilson: Boston Med. and Surg. Jour., 1908, Vol. clix, p. 559.

We recognize that the case is not yet proven beyond argument. These cases, occurring, as they do, in industry; resulting, as they do, in a crippling, serious enough to prevent resumption of regular work, are curiously hard to trace, particularly in a municipal hospital in a town of very shifting population.

We believe that far better results than are obtained today are obtainable by the methods sketched out in the article of 1908, above referred to. At the same time, we recognize that our present investigation can do no more than help the profession to an understanding of the terribly serious disabilities resulting from fractures of the os calcis, treated according to the commonly accepted rules. The cases follow:

CASE 1. S. S.; aged 24; fell 18 feet, July 19, 1912; plaster; no anesthesia. Examination October, 1915: is working as a sign painter; ankle stiff in the morning; has a good deal of pain, and limbs; moderate flat-foot; heel slightly thickened.

CASE 2. G. M.; aged 49; fell about 12 feet, October 30, 1912; plaster. Was lame for 7 months; now no symptoms (examined October, 1915); heel thick and has no lateral motions; at his work in the Navy Yard.

CASE 3. D. G.; aged 50; teamster; thrown off team, August 4, 1912; much flattening; reduced under ether; no work for 13 months. Examined October, 1915; unable to work since December, 1914; heel much broadened and flattened; no lateral motions; flexion and extension limited; entirely disabled.

CASE 4. J. R.; aged 37; teamster; fell down elevator shaft, November 15, 1912; considerable deformity; plaster only. Examination October, 1915, shows lateral motions very much restricted; flexion and extension slightly limited; has a considerable limp; able to work as a "striker" on a coal team.

CASE 5. J. R.; aged 35; fell 10 feet, October 1, 1912; ether; reduction and impaction. Examined October, 1915; lateral motions restricted; very slight limp; is working as a fireman in engine house.

CASE 6. W. C. D.; aged 58; druggist; fell down a shaft, January 12, 1913; plaster; unable to walk for nine months. Examination October, 1915; walks with a very decided limp and has a great deal of pain; flexion and extension as well as lateral motions practically 0; a great deal of thickening through the heel; arch flat; walks about with a stick; practically crippled.

CASE 7. A. P. D.; aged 54; painter; March 28, 1913, fell 20 feet; definitely fractured but without great displacement; Cotton thought it did not need reduction; plaster only. Examination October, 1915;

shows a good deal of thickening under external malleolus and almost entire loss of lateral motions; some tenderness; is working at his trade.

CASE 8. J. R.; aged 40; carpenter; April 23, 1913, fell 8 feet; ether; reduced and impacted with the mallet; plaster; back to work after 11 weeks but had trouble for 6 months. Examined in October, 1915; X-ray taken October 29, 1915, shows shape of bone excellent; all motions on examination are apparently perfect; walks well and has no pain; is back at his work as a carpenter.

CASE 9. J. M.; aged 18; painter; fell 30 feet, May 22, 1913; fracture right astragalus and left os calcis; X-ray taken May 23, 1913, shows well-crushed os calcis but not with extreme displacement; no reduction was done; walked without crutches after 9 months. Examined in October, 1915; has a great deal of pain and a limp; general thickening about the left heel; extension and flexion greatly limited; lateral motions entirely lost; is back at work as a painter.

CASE 10. J. J. H.; aged 44; stableman; May 12, 1913, fell 20 feet; X-ray taken May 13, 1913, shows os calcis split in various directions; not much involvement of the posterior calcaneo-astragaloid joint; ether; reduction; hammer impaction after manipulation; unable to walk for eight months. Examined in October, 1915; walks with a limp on the left foot; there is considerable thickening of the left heel, especially under the external malleolus; flexion and extension slightly limited and lateral motions almost entirely lost; pain after much walking or on long standing, but can and does work.

CASE 11. M. S.; aged 40; longshoreman; September 18, 1913, fell 14 feet; "reduction" and plaster only; X-ray of September 22, 1913, shows os calcis well mashed down; unable to walk for six weeks; has always had a limp since then. Examination in October, 1915; lateral motions gone; flexion and extension slightly limited; much thickening about the heel; arch flat; a good deal of pain. *Unable to work.*

CASE 12. X. Y.; aged 38; hotel manager; December 1, 1913, jumped from window in delirium; fractured left os calcis; gas; os calcis "pounded"; plaster. Examination October, 1915; a good deal of deformity; arch gone; all motions of foot practically lost; walks with a limp, using a stick. *Practically a cripple.*

CASE 13. G. R. P.; aged 45; painter; July 24, 1914, fell from staging; did not remain in hospital for treatment. Examination in November, 1915; much pain and limping; general thickening about heel and all motions restricted; lateral motions lost. *Entirely crippled, except for embarrassed walking.*

CASE 14. D. D. D.; aged 54; laborer; March 22, 1915, fell from staging on right heel; no reduction. On examination in November, 1915, lateral motion lost entirely; flexion and extension much limited; all motion painful. *Unable to work or to walk any distance.*

CASE 15. L. B.; aged 50; laborer; Mar. 5, 1915, fell 10 feet on left heel; ether; manipulation; plaster. Examination June 7, 1915; unable to walk without limping and pain; flexion and extension limited; lateral motions lost. *Unable to work.*

CASE 16. B. C.; aged 38; laborer; May 17, 1915, fell through elevator shaft on left heel; ether; attempted impaction (not by me). Examination July 28, 1915; broad heel; lateral motions lost; no great pain except after use. Examined August 25, 1915; unable to bear weight on left foot; considerable thickening of heel; complaint of pain especially under external malleolus; flexion and extension limited; adduction and abduction entirely lost. X-ray October 29, 1915, shows a crushed os calcis that looks hopeless. *Unable to work; cripple.*

These sixteen cases, be it noted, are Boston City Hospital cases from an institution where os calcis fractures are probably less misunderstood and better handled than anywhere else. Yet of these sixteen, eight are cripples; the rest, not all of them results to be proud of. Of the eight able to work, one just about holds his job; of the other seven there are but three that did not have *some real attempt* made at reduction, and one of the three was let alone because there was practically no displacement of the fragments. Of the nine cases in which some attempt was made to reduce, we find five back at work, and one working but hindered. These sixteen are, though crudely, picked cases.

Now as to the Accident Board cases. These again are unselected cases. There is a theoretical chance that certain cases may have gone back to work promptly and never have come to anyone to be passed on, but from what I know of os calcis fractures and of insurance adjusters, this seems a negligible possibility.

CASE 17. H. L.; aged 37; carpenter; accident November 1, 1913; fell 10 to 12 feet on heel; treated as a sprain at first; was a patient at the Massachusetts General Hospital for 6 months in the winter of 1913 and 1914; June 10 to July 8, 1914; was operated. Seen November 23, 1915; shows some flat-foot; lateral motion limited but not gone; is suffering just now mostly from a very tender scar; probably remediable; *is not fit for work.*

CASE 18. J. A.; aged 56; teamster; December 1, 1913, fell 15 feet,

more or less; fractured os calcis; X-ray; no ether or reduction. Examined June 3, 1914; shows evident result of os calcis fracture on the left; much loss of lateral motion; much bony thickening on the outer side. *Was entirely disabled after six months.*

CASE 19. J. B.; aged 27 years; fell 25 feet on left heel; for nine days at Frost Hospital; treated as a sprain; back also hurt; no treatment, apparently. Seen May 18, 1914; shows much bony thickening of the left os calcis; at present unfit for his work (captain of a lighter), but the prognosis seems to me rather hopeful.

CASE 20. M. J. C.; aged 64; jumped from team April 2, 1915; Boston City Hospital; X-rays taken; reduction refused. Left ankle, on July 12, 1915, showed slight thickening below the malleoli; heel seems short; some tenderness laterally; arch flat (right and left); *disabled*. Re-examination on October 20, 1915; shows some slight improvement; has less pain; has wholly lost the spring of the damaged foot; *unfit for work*.

CASE 21. J. F. D.; aged 38; fell 11 feet; June 6, 1915; examination November 4, 1915; says he took no ether; cast for six weeks; says he is good for half hour at walking and no more; pain mainly on the outer side. Shows the type lesion with much thickening below the external malleolus; has very little lateral motion; heel broad and arch flattened; flexion and extension good. *Not fit for work.*

CASE 22. J. G.; aged 44 years; March 7, 1913, fell off ladder, landing on his heels; City Hospital for a week; later treated at the Massachusetts General Hospital; after five months went to work; laid up next five months; worked five months; laid up since then. Examination August 4, 1914; right foot shows type deformity, not very marked; has a little lateral motion; has much pain localized where the external malleolus strikes the thickened os calcis; has been trying-out all sorts of plates and bandages. *Unable to work at present; not likely to improve.*

CASE 23. C. H.; aged 42; laborer; August 11, 1915, fell 16 feet, more or less; landed on his heel; treated at the Brigham Hospital. Examined November 24, 1915; shows a left foot with the characteristic deformity; not extreme; flexion and extension normal; lateral motion limited but better than in most of these cases; sensitiveness now entirely on the outer side of the foot and not very great. *Not fit for work at present.*

CASE 24. D. M.; aged 25; laborer; fell 15 feet August 15, 1914; fracture os calcis, both right and left; seven weeks in the Brockton Hospital; plaster only. Examined May 3, 1915; still has much pain on outer side of either ankle; can walk about a half hour; very stiff in mornings; still slowly improving. On examination he walks stiffly; shows much

thickening of both heels, especially on the outer side; lateral motions very much limited; flexion and extension good. Is not yet done improving at nine months, and is going to get some function, but I *doubt if he ever goes back as a laborer; is now a cripple.*

CASE 25. J. J. S.; aged about 30 years; employee Boston Protective Association (fire work). June 15, 1913, fell down sliding pole in fire house and fractured one os calcis; reduction next day; X-ray; later arch plates, etc. Examined July 16, 1914; still, after 13 months; fit for house duty only. Shows thickening below the external malleolus; flexion and extension near normal, but lateral motion substantially none; is wearing a plate that rocks his foot over as far as it will go into supination; gets about fairly well but seems *not likely* ever to go back to *active work.*

CASE 26. V. D.; laborer; accident September 24, 1913; fell from a broken staging; treated in New Bedford; in hospital three months. Examined July 22, 1914, ten months after accident. The right foot shows evident old os calcis fracture, with the typical broad, short, flat heel. He is a Portuguese without much English, and the history is faulty, but from scars present, the fracture seems to have been compound with some loss of tissue. There has been, obviously, a fracture of both bones, just above the ankle, beside the calcis lesion. The foot is practically fixed; there has been some contracture of the calf muscles and he cannot put his foot down squarely. The result is not chargeable to the os calcis fracture alone, but, in fact, at present date he has a foot and leg far less useful than those furnished by artificial limb makers. He is an *absolute cripple*, without prospects.

CASE 27. D. E. M.; aged 35; longshoreman; fell only four or five feet on an iron track; accident March 4, 1914; in hospital five days. Examined July 28, 1914, after four months. Is still using crutches; examination shows unmistakable os calcis fracture with the usual deformity of thickening, mostly on the outer aspect, and loss of motion, particularly of lateral motion. The estimate of disability at the time of examination was six months before improvement ceased entirely, and a doubtful—very doubtful—prognosis as to his going back to work *at any date.*

CASE 28. J. T. L.; aged 48; fell 14 feet on September 22, 1915; landed on the right foot; treated at the City Hospital; no ether; plaster. Examined December 30, 1915, after three months. Showed obvious thickening of the outer side of the heel; some thickening of the inner side also. Shows unusually good lateral motion; flexion and extension good. Not ready for work as yet, but *likely to come back to usefulness.*

Confessedly imperfect, this list of results (many of them fairly to be

listed as end-results) shows an appalling percentage of serious, and often total, disability.

It would seem that the paper published in 1908 should have demonstrated the seriousness of the lesion and of the insufficiency of the care usually vouchsafed by hospitals and practitioners. It seems not to have had this effect.

In the first string of cases, a fair number were treated with at least some realization that the text-books were piffle, the lesions serious. Some of the results were good. In the second series, not a case seems to have been treated with any real comprehension of the situation.

Let us contrast the two lists:

1. Examined three years later; still has some pain, but is working at his trade; no reduction attempted.
2. No reduction, but after three years is back at his work without any symptoms.
3. Attempted reduction; able to work intermittently, but at three years afterward is unable to work.
4. Able to work as "striker" on coal team, three years later.
5. Reduction and impaction, Cotton method; working as fireman in engine house after three years.
6. No reduction; entirely crippled after three years; can walk with a cane.
7. Displacement so slight as not to call for reduction; working two and one-half years later at his trade as painter.
8. Reduction and impaction; Cotton method; at two and one-half years is back at his work as carpenter without limp or pain.
9. No reduction (also astragalus fracture on other side); at two and one-half years is back at work as a carpenter, though he has no lateral motion in the injured foot.
10. Cotton reduction; after two and one-half years has still some limp and some pain, but is back at his work as a stableman.
11. Attempt to pull fragments into place; two years later unable to work as longshoreman.
12. Attempt at reduction; two years later unable to walk much; uses a stick.
13. Refused treatment; sixteen months later is still crippled.
14. No reduction; at 7 months still an entire cripple.
15. Manipulation only; at 3 months no return of useful function.
16. Cotton reduction; not very successful; after 5 months not able to work.

In the second list, those seen late in industrial examinations:



17. Treated as a sprain, later operated on. After two years unable to work, with no prospects.

18. No reduction; at six months entirely disabled.

19. Treated as a sprain, much bony thickening; unable to work ten weeks later, but ultimate prognosis seems fair.

20. Reduction refused; six months later entirely disabled.

21. Not reduced; examined five months later, much bony thickening, lateral motion gone, unfit for work.

22. No reduction; went to work at five months then laid up five months, then five months at work, then disabled to date of examination at 17 months. Unable to work because of pain.

23. Not reduced; examined after three months; unfit for work, may improve later.

24. Double fracture os calcis, right and left; no reduction. Examined after nine months; entirely crippled, no prospects.

25. Some sort of manipulation. Examined after thirteen months; much thickening; lateral motion gone. Walks fairly well, but cannot work.

26. No reduction. Examined at ten months; shows broad flat heel; also had a break above ankle. Is totally crippled, without prospects, essentially as a result of the heel fracture.

27. No reduction. Examined after four months; still on crutches; thick heel, lost motion. Prospects very poor at best.

28. No reduction. Examined at three months; thick heel but less lost motion than usual. Useless now, but may come back.

In the first list, out of sixteen only eight got even a useful result, and in one of these the displacement was so slight that one of us felt that no reduction was called for. Of the other seven, four recovered in spite of "conservative" treatment, but of these four, three still had trouble. The other three were cases that had been properly reduced, and in all three the result seems excellent. In four which had been "manipulated" only, the result was poor, and of these eight practically untreated only four got any kind of result.

In the second list none had been treated, and there were no decent results at all. Out of the twelve, nine are definitely permanent cripples. Two are due to improve and may possibly work again,—one probably will get back to work.

Obviously three conclusions are justified:

1. Conservative treatment gives incredibly bad results.
2. We must do better than this; it must be possible!
3. The reduction suggested and practised is a step forward.

## FRACTURE OF TUBEROSITIES OF THE TIBIA. A REPORT OF THREE CASES.

BY JAMES WARREN SEVER, M.D., BOSTON.

THREE cases of this rather unusual type of fracture have been called to my attention recently. A search of the literature fails to give me much information in regard to this fracture or its results. Consequently it seemed to me that putting these cases on record might be of help to others who might meet with a similar condition. All were directly traumatic, one being the result of an automobile accident, the others the results of a fall. The detail of the way the injury was obtained, or the force, which caused the fracture, applied or directed, I was unable to learn.

Robert Jones<sup>1</sup> reports two cases of fracture of the tuberosities of the tibia associated with fracture of the tibial spine. In both cases good results were obtained, one by operation and in the other by prolonged rest. In the case operated on the anterior crucial ligament was found ruptured and a piece of the tibial spine torn off. It seems probable that two of these cases of mine, in view of their increased outward rotation and lateral mobility or abduction of the tibia, had torn anterior crucial ligaments. Possibly an operation to repair this damage might have given them a more stable joint.

Fowler<sup>2</sup> reports a case of fracture of the external tuberosity of the tibia associated with an external dislocation of the knee, following a fall of about 3½ feet. The patient landed on his feet and then fell to the ground. The patient died ten days later of pneumonia, and at autopsy the knee-joint showed the following condition: "The outer half of the head of the tibia was the seat of a comminuted fracture. The external lateral ligament was torn away across, the anterior completely torn, the internal only partially ruptured. The anterior crucial ligament was torn and the posterior was intact."

S. Lange<sup>3</sup> also has reported two fractures of the tuberosities of the tibia, together with other obscure fractures involving the knee-joint.

CASE 1. M. S., age 26, female. (See X-ray No. 1.) Patient was knocked down by an automobile on October 20, 1915, and her right knee injured. She was taken to a hospital, where her knee was immobilized. At that time the examination failed to show crepitus, the knee was swollen and tender, but could be flexed and extended fully. An X-ray examination showed that the external tuberosity of the tibia had been fractured obliquely into the joint. The break apparently did not extend all the way through the tuberosity to the back of the bone, but involved apparently, about the anterior two-thirds of the articular surface, which

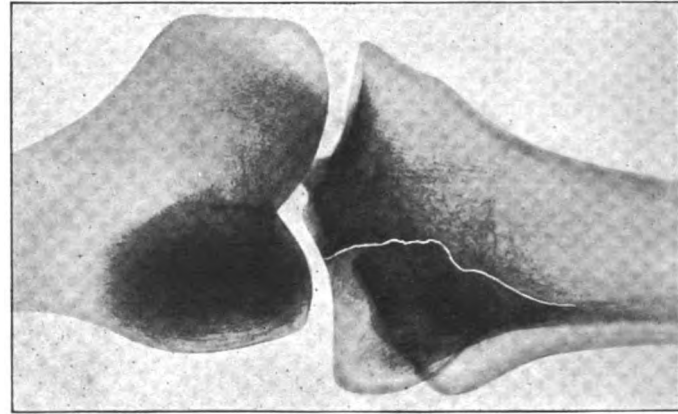


FIG. 1.—Note knock-knee and widening of head of tibia. Line of fracture through the external tuberosity of tibia into joint, with dropping of external articular surface.

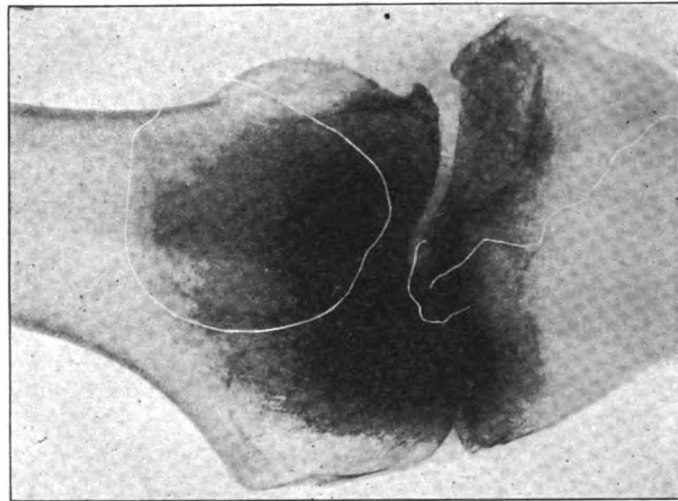


FIG. 2.—Note widening of tibial tuberosities. Line of fracture involving spine and both tubercles of it. Dropping of articular surface below the line of the head of the fibula. Compare spine of tibia with that in x-ray No. 1.

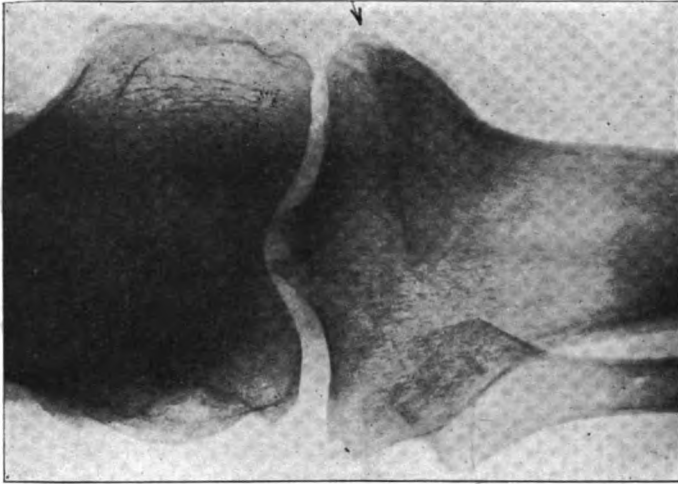


FIG. 3.—Note line of fracture through head of tibia.

was displaced downward and outward. The line of fracture started very close to the spine of the tibia, and ran downward and outward. There was no apparent fracture of the spine itself.

I saw her first on December 11, 1915, and a week later applied a light plaster cast, the front of which was later removed so as to massage the leg and allow active and passive motion. The patient made an uninterrupted convalescence. The result at the time of her discharge was not a perfect knee, however, for she was left with a moderate degree of knock-knee and considerable lateral mobility of the knee-joint in an outward direction, combined with free outward rotation of the tibia. The question of how much this mechanical disability, from joint relaxation, can be controlled by muscular action, is to be answered only by time and use. I doubt very much whether she will be very comfortable without some support under the inner edge of her shoe, so as to prevent, as much as possible, knock-knee or subsequent joint strain. At present she is walking on the leg without crutches, but does not seem inclined to use it a great deal, as it is not as yet very strong.

CASE 2. N. B., aged 59, stevedore. Accident, July, 1913. Fell about four feet, landing on right knee. Taken to hospital, where he had a cast applied, which he wore about two months. Soon after leaving off the cast, he had a caliper splint on his leg for about two months, without relief. He complained, when I saw him about 2½ years after the accident, of his inability to walk any distance without the use of a crutch or cane; also that his leg was weak, painful and easily tired. He has been unable to go back to his work as a stevedore since the accident.

Examination of the right knee showed that there was very little limitation of motion in flexion and none in extension. There was a moderate degree of knock-knee on the right and more lateral mobility, particularly in abduction, than there should be. There was slight bony thickening about the external tuberosity of the tibia. The X-ray of the right knee-joint showed that the injury had caused a fracture through the external condyle of the head of the tibia, extending into the joint, and causing a moderate downward and outward displacement and slope of the external articular surface of the knee-joint. The spine of the tibia had apparently been involved also, and presented some evidence of callous formation and displacement. (See X-ray No. 2). This fracture apparently does not go completely through the articular surface, but apparently has taken off the anterior two-thirds back to the line of the fibula, and extends inward to the inner edge of the spine of the tibia.

This change in the weight-bearing surface of the knee-joint is the direct cause of the knock-knee and joint-strain. Whether an operation, planned to restore the level of the joint surfaces and repair the crucial ligaments, could be done without doing too much damage to the joint, and possibly without any real benefit, I do not know. I imagine that con-

siderable of the disability could be met and prevented by a Thomas sole and heel, and possibly quite as much accomplished as by an operation, except in some severe cases.

It is of interest to note that in this second case there has been and is no limitation of full extension of the leg or the thigh, which might be expected from the X-ray findings, showing such a marked change and callous formation in the spine of the tibia.

No operation was done on either of these cases, and they both have knock-knees and strained joints. Both conditions, however, can probably be easily controlled by balancing the foot and leg in proper weight-bearing lines, without much difficulty.

CASE 3. A. R., 45. This man fell a distance of about 60 feet, six months ago. He was taken to a hospital, where he stayed about two weeks. There it was found that he had sustained a Pott's fracture of the right ankle, a contusion of the right knee, a fracture of the head of the tibia on the left, and a contusion of the left shoulder. He wore a ham splint on the left leg only for about a month, since which he has been walking about on that leg.

The leg now presents the following condition: There is some thickening about the internal tuberosity of the tibia, with a distinct ridge to be felt where apparently the upper fragment had slipped forward slightly. Some of the swelling is undoubtedly due to callous formation. The patella is movable. There is no joint thickening and the leg can be fully extended, but can be flexed to about a right angle only. He can stand and walk well, and there is no knock-knee or bow-leg. Functionally, he seems to have a pretty good leg, with prospects of a better one. This fracture was probably caused by direct violence, either by falling directly on the knee, or more likely by being struck by a timber or steel floor beam during the process of the fall. He has a perfect result from his Pott's fracture on the other leg.

X-ray (see No. 3) shows on femur, on internal aspect of internal condyle, a small bony exostosis. Shows also a transverse line of fracture through the head of the tibia beginning at the inner edge of the internal tuberosity and running downward and outward to the middle line of the shaft. There is a slight overlapping of the edges of the fragments. The spine of the tibia appears normal. There is also a fracture of a portion of the head of the fibula.

#### REFERENCES.

<sup>1</sup>Jones, Robert, and Smith, S. Alwyn: On Rupture of the Crucial Ligaments of the Knee and on Fractures of the Spine of the Tibia. *British Journal of Surgery*, Vol. 1, No. 1, 1913.

<sup>2</sup>Fowler: External Dislocation of the Knee. *Journal American Medical Association*, Dec. 30, 1911, Vol. lvii, No. 27.

<sup>3</sup>Lange, S.: Obscure Fractures Discovered by Roentgen Examinations. *Lancet-Clinic*, August 8, 1908.

# Orthopedic Society Meetings

AMERICAN ORTHOPEDIC ASSOCIATION.

THIRTIETH ANNUAL MEETING, TO BE HELD AT WASHINGTON, D. C., MAY 8-11, 1916.

THE first day of the meeting of the American Orthopedic Association, to be held in Washington, May 8-11, will be given up to a clinical day. The local committee has arranged what should be a most attractive program to precede the didactical work which will come the following three days. A number of members have been asked to operate and the subject of infantile paralysis, which is to be one of the chief subjects under study on the following day, will supply the greater part of the material.

In recent years, many of our members have presented interesting operative methods, and we are to have this opportunity to see these methods demonstrated. The committee has arranged that all of this work is to be done at the Emergency Hospital, beginning at nine o'clock, and probably lasting until about two, as there will be seven or eight operations done.

DR. WHITMAN will do an astragalectomy for calcaneus. DR. SOUTTER will do one of his new operations of changing the position of origin of the flexors of the thigh so as to overcome permanent flexion. DR. GALLIE will demonstrate his recent work on implantation of muscle tendons to correct deformities, and DR. PLUMMER will do one or two cases of silk ligament inserts. The committee also expects to have DR. SEVER demonstrate his very recent work on obstetrical paralysis, if the material is available. They hope to have DR. BAER demonstrate the implantation of membrane in fixed joints. DR. ALBEE will also demonstrate his bone-graft operation in Pott's disease. In addition, the committee hopes that they will be able to have DR. HOKK do one of his club-foot operations, the result of which he has so frequently of late given us in the moving pictures.

The Emergency Hospital is within short walking distance of the Willard Hotel, which is to be the headquarters of the Association. To reach it from the Willard, one should walk directly west, passing just south of the Treasury, around the White House lawn, and past the State, War, and Navy Buildings. This leads out immediately opposite New York Avenue at Seventeenth Street, and the Emergency Hospital will be found at the middle of the block on the north side. To reach it by car, the car marked F & G Streets, or Georgetown, of the Pennsylvania Avenue line will take one to within two or three blocks of the hospital.

It has been the desire of those arranging the schedule that the meetings of the Congress of American Physicians should not be interfered with by the meetings of the Association. This necessitates long morning sessions and perhaps one evening session.

Washington is always interesting to its visitors, and never more beautiful than at the season chosen for this meeting, and the ladies accompanying their husbands will find a great deal of interest to occupy their time. DR. SHANDS, at 901 Sixteenth Street, will entertain the Association and candidates at a stag luncheon. The dinner on Wednesday night, should be very interesting, as we have obtained Senator Owen of Oklahoma to talk to us on the subject of a National Health Service, besides a cabinet representative. The dinner will be at the Willard Hotel about 7.30 o'clock, and the privilege of subscribing will be extended to the candidates and guests.

A lantern will be on hand for the entire session, and arrangements will be made for the exhibition of x-ray plates and apparatus.

The final program for the Washington meeting is now issued, and it certainly gives good prospects for an interesting occasion. The arrangement and grouping of papers shows careful planning on the part of the President and Secretary,

and the large numbers of miscellaneous papers show the extent of the work being done by the members of the Association.

Attention is called to the joint meetings with the Congress of Physicians and Surgeons, of which the Association is a part. The place of meeting for both is the New Willard Hotel, so that members should see to it that accommodations are reserved beforehand. The Committee on Arrangements, DR. JOHN DUNLOP, Chairman, will be glad to be of any service to members.

## Book Reviews

*La Cure de Soleil.* By DR. A. ROLLIER. Illustrations, 134. Colored plates, 28. Roentgenograms, 66. Paris: Ballière et Fils. 1914.

It is a pleasure to peruse this volume of Rollier's; his encouraging enthusiasm is sure to be convincing to one who carefully reviews the results of his work. He started at Leysin in 1903, hoping to be able to carry out rigorously a method of therapy that he felt was based on the demands of science as well as those of clinical teachings. Convinced that tuberculosis is not a purely local affection, and that the osseous types are consecutive to a primary glandular or intestinal infection, he considers the cure of the sun a rational treatment. The exhilarating air and reflected sunshine at the seashore had been proven of value. The intensive application of the sun bath in dry altitudes seemed to him the most important factor. Therefore in cases of tuberculosis of the joints, Rollier thinks sufficient immobilization or at least rest of the affected parts can be obtained by the use of the frame and traction and that plaster of Paris fixation is then unnecessary. Thus he is enabled to secure complete exposure of the whole body to the sun's rays. This fact he emphasizes, and it is due to the thoroughness with which he has carried out this idea continuously for a sufficient length of time in each case, that he has obtained results so much more satisfactory than many of those who have followed his methods.

Rollier has to acknowledge that scientific research has not yet been able to explain the chemical and metabolic effects of the absorption of the sun's rays through the skin, the interpretation of the pigmentation and the stimulus of the actinic rays to living tissues. There is good reason to believe that altitude is of advantage, but also much evidence that dry air with little wind is best adapted to this treatment. Rollier exercises greatest care in beginning the exposure very gradually, because of the chance of too great reaction to the intensity of the sun's rays as they are in a dry mountainous climate.

Several chapters are devoted to the treatment of varied types of tuberculosis and other chronic diseases that may be helped by this method. Rollier very rarely has to resort to any surgical measures other than the aspiration of an abscess. The cases are made clear by a profusion of roentgenograms and illustrations, many in colors. The consecutive pictures of many cases show the wonderful results obtained while under his care. The great list of cures and the continued increase in the number of patients has led to the establishment of similar clinics. Rollier, in a chapter considering the social and economic point of view,

says that the treatment is not only practical at an altitude or by the sea, but has been beneficially carried out in the low lands and even the larger cities, as by Poncet at Lyons, and Bardenheuer at Cologne.

Even though we recognize tuberculosis of the bones as a self-limited disease, and appreciate the wonderful orthopedic care that Rollier is able to give his patients, the course of the disease in his cases is shortened by one to two years, and the results obtained are far better both locally and generally than the average. We must accept his claim that heliotherapy is of great value. This volume merits the study of everyone interested in the care of a disease that is most discouraging in its slow, chronic, persistent course.

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*Fractures and Dislocations; Diagnosis and Treatment.* By MILLER A. Preston, First Lieutenant M. R. C., U. S. Army. Chapter on Roentgenology by H. S. STONER, M.D., Professor of Roentgenology, School of Medicine, University of Colorado. St. Louis: C. V. Mosby Company. 1915.

In the foreword the author states "that the object of this book has been to offer the reader a working knowledge in as few words as possible, avoiding for the most part all theories and arguments" and "to make the reader an eye witness to the various deformities."

"The more common fractures have been accorded the greatest amount of attention, since they are the conditions with which the average practitioner will have to deal most frequently," and "the time honored academic classification of fractures under one heading and dislocations under another has been abandoned, and the more practical method of considering the injuries according to the region in which they occur has been followed."

The author has planned his work exceptionally well and the book appears to be a frank expression of experience. The departure from the stereotyped arrangement is pleasing, and great credit should be given for the painstaking photographs which make up the bulk of the illustrations, as many must have been made under somewhat difficult circumstances. The rather dogmatic choice of one method to the exclusion of others is, perhaps, an error, as it fails to give a comprehensive idea of treatment. However, this can hardly be considered a point for criticism, as every workman must choose his own tools, and, if they serve him well, he naturally sings their praises. The modification of classical dressings without impairing their usefulness is a difficult matter, and the value of some of the suggested changes is open to question.

More might be said in the chapter on open treatment of fractures and bone transplantation.

A rather important omission is the lack of references to more exhaustive articles, as the book purposely avoids the discussion of all theories and arguments. Many of the apparent inconsistencies and shortcomings are of minor importance and will undoubtedly be corrected when the opportunity affords.

The book has been written, and as the subject is presented at a somewhat different angle, it can be read with profit.



# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.
- X. War Surgery.

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

THE PHYSIOLOGICAL METHOD OF TENDON TRANSPLANTATION. Leo Mayer. *Surgery, Gynecology and Obstetrics*, February, 1916.

### 1. Historical; Anatomy and Physiology of Tendons.

Mayer's article is a very complete description of the various principles which should be observed in tendon transplantation. It shows a vast amount of work which he has expended in his researches and experimentation. He contrasts the methods used by Nikoladoni, Lange, Vulpius, Stoffel, Putti and others, pointing out the discrepancies which exist in their method of operation and after-treatment. He states clearly the plan and history of his research and gives a tabulation of the points in his plan of investigation. The anatomy of the tendon and its surrounding structures is very clearly given in detail and the function of each structure is discussed. The relationships and physiology of the muscles and tendons under discussion are most scientifically outlined, showing the great importance of observing care and properly utilizing the tendon, as well as its associated structures in tendon transplantation. The method of anchoring the tendon, the tension of the tendon and the direction of pull are points which he especially emphasizes. The importance of utilizing the sheath of the tendon is decidedly emphasized.

He shows that opinions previously given concerning the blood supply, i.e., that the tendon has a very scanty blood supply, are erroneous, and that his and other men's experiments, by injecting the blood supply with colored solutions, show that the blood supply of tendons is very considerable; consequently operative measures should take into account this anatomical fact. Furthermore, the mechanism of the gliding of tendons should be very carefully considered before a tendon is transplanted into a new bed to perform a new function.

The facts which he gives are based upon animal and cadaver experimentation, and also are gained by various operative measures upon patients.

The article has 29 cuts, illustrative of the points set forth. This is the first of three papers which he has planned to give. The second will describe the physiological tendon transplantation, and the third, experimental and clinical results of the physiological method. The paper is clearly and well written and deserves a great deal of credit.—William Jackson Merrill, Philadelphia.

AN OPERATION FOR THE CORRECTION OF THE DEFORMITY DUE TO "OBSTETRICAL PARALYSIS." Mark H. Rogers. *Boston Medical and Surgical Journal*, February 3, 1916.

Rogers brings to the attention of the profession an operation described by Vulpius and Lange, for the purpose of ameliorating the inward rotation of the humerus following obstetrical paralysis.

A transverse osteotomy is done about two inches below the head of the humerus. The lower fragment is then outwardly rotated one-quarter turn, while the upper fragment is held still. The humerus is allowed to unite in this position so that as an end result the deformity is greatly improved.

Rogers has operated upon three such cases, with an excellent result in each instance.—H. A. Pingree, Portland, Maine.

✓ INFANTILE PARALYSIS. R. T. Taylor. *New York Medical Journal*, January 28, 1916.

This article is a general résumé of the work on this subject.

Preventive measures: Isolation, frequent spraying of naso-pharynx. For those in contact with the case, proper protection of hands, clothing and respiratory tract.

Treatment:—

Febrile stage: Elimination, rest, light splints, prevention of tension on such muscles as deltoids and quadriceps; urotropin may help; hot packs for hyperesthesia; ice cap to head; plenty of water per mouth or rectum, or both; sponging for fever; lumbar puncture for relief of tension, respiratory failure, and diagnostic purposes. The author lays great stress on the need of physiological rest for various parts of the body.

Convalescent stage: It is a mistake to get the child up too quickly or make attempts to walk. Patient should have light massage and passive motion, later changed to active, against resistance; cautions against too deep massage or over-manipulation; warm air bath followed by massage and muscle-training to stimulate voluntary effort; stretching of shortened and over-acting opponents; prevention of the occurrence of deformity by light splints or braces.

Chronic stage: A description of the operations of various authors is given for the following: Tenotomy, myotomy, tendon lengthening and shortening, tenodesis, extra- and intra-articular silk ligaments, arthrodesis, articular transposition, astragalectomy, nerve anastomoses and tendon transplantation. Short résumé of the various well-known procedures is given. The importance of going under the annular ligament in transplantations around the ankle is emphasized. The author reports use of following operation in three hundred cases since 1909.

Tourniquet used; four incisions made—small. First, at insertion of over-active muscle; second, over same muscle above, where muscular fibers become tendinous; third, at point of proposed insertion; fourth, over annular ligament. The tendon is drawn through subcutaneous fat to annular ligament, then, with small mosquito forceps, under it to point of insertion; extension with silk if too short; number five braided black silk is used; osteo-periosteal insertion; stitches out eighth day; cast for sixteen weeks; no weight-bearing for the first eight weeks, then allowed to walk on casts. Transplantation not advised until two years after acute attack and mutilating operations, such as arthrodeses, only as a last resort.—C. L. Lowman, Los Angeles.

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

**TONSIL IN ITS RELATION TO RHEUMATIC INFECTIONS.** T. H. Halstead. *New York State Journal of Medicine*, November, 1915.

The definite function of the tonsil is not known, but those men who do not believe in tonsillectomy assume that some internal secretion of the tonsil is necessary to the human organism. From the pathological aspect, the small buried tonsil, which is found after several attacks of tonsillitis, is most likely to be the source of a systemic infection. The teeth and the tonsils are usually associated in the greater proportion of cases of chronic infection.

Poynton and Paine have reported in England that a streptococcus which lodges most favorably and commonly in the tonsillar crypts, is the specific cause of the rheumatic infections in joints. Davis found the *Micrococcus rheumaticus* as the predominating organism present in the tonsils of 25 out of 28 arthritic cases. Animals inoculated with these strains of streptococcus produced definite joint symptoms in every case. Removal of diseased tonsils in the author's experience was most satisfactory in the majority of cases, some being seemingly cured, in some the disease was arrested, while in the chronic and well-advanced rheumatoid arthritis no favorable result was produced. The suggestion is made that rheumatic infection is contagious. Several typical cases are cited where diseased teeth and tonsils were removed with beneficial results in regard to the joint lesions.—*Custis Lee Hall, Boston.*

**QUIET HIP DISEASE.** Henry Ling Taylor and William Frieder. *Surgery, Gynecology and Obstetrics*, February, 1916.

Taylor and Frieder discuss the symptomatology of quiet hip disease, giving its chief characteristics, and contrast the malady to other hip affections. The chief clinical symptoms are given, also the gross pathological findings, together with certain deformities that result from the condition, but do not give conclusive information concerning the etiological pathology. There is no distinctive line drawn between this affection and certain toxic and infectious conditions that are found clinically. The history of several cases is given in brief detail. The authors believe that osteochondritis of the hip, or Perthes' disease, is a distinct morbid entity, that it has characteristic symptoms, that it is benign and rather common. Treatment is simple, prognosis good. It is a dysostosis of unknown causation.—*William Jackson Merrill, Philadelphia.*

### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

**CAUSES OF RICKETS: THE ROENTGEN RAY FINDINGS.** W. Jacobsohn. *New York Medical Journal*, January 8, 1916.

The cause of rickets is an irritant which produces an overgrowth of osteogenetic tissue. The cause of this irritant, the author states, is unknown. Lesions are constant and characteristic, chiefly in bones, because of lessening of lime deposit.

In Italian and negro races, mothers nurse children during pregnancy, and the salts in their milk decrease with frequent pregnancies, also when pregnancy occurs during lactation.

Artificial feeding, proprietary foods, excess of carbohydrates, causing non-assimilation of salts, and bad hygienic surroundings are given as causative factors.

The usual bone lesions and deformities produced by this condition are described.

For Roentgen study he gives the following classification:

1. Epiphyses and zone of proliferation.
2. Outline of cortex and periosteum.
3. General structure of bone.
4. Medullary canal.

—C. L. Lowman, Los Angeles.

#### DWARF GROWTH PROBABLY DUE TO DISTURBANCES IN INTERNAL SECRETION.

M. Levy. *Ztschr. f. klinische Medizin*, 1915, LXXX, Nos. 1-2.

Author states that dwarfism is the end result of various disturbances of growth. If individual parts of the skeleton are affected and others not, as in chondrodystrophy, Kaufmann's fetal rachitis, disproportion between the limbs and the head and trunk results. If, on the other hand, the whole body is affected by the disturbance, the proportion of different parts is not destroyed. This latter group v. Hansemann has subdivided into two: 1. Essential dwarfs,—those who are smaller than normal people, but whose development otherwise has gone on normally. 2. Infantile dwarfs,—those who were of normal size at birth, but who grew up only to a certain time—for the most part in early youth.

This latter again is the von Paltauf type, which is described as not differing from the normal at birth, and developing normally up to a certain point, when growth ceases. The epiphyses fail to unite. Intelligence is not impaired. The genital organs and secondary sexual characteristics remain undeveloped. Such a case Levy reports in detail, giving photographs and X-rays. There was complete failure of ovarian secretion and disturbance in the secretion of the thyroid in this case.

The author concludes that we must conceive of two processes side by side, both due to deranged internal secretion, producing, on the one hand, a definite group of symptoms, and on the other, dwarf growth.—Freeman Bosworth, Boston.

#### DUCTLESS GLANDS AND ATYPICAL GROWTH. S. W. Little, *New York Medical Journal*, January 29, 1916.

The author calls attention to established facts regarding influence of ductless glands on growth of cells; differentiation and peculiar selective action in certain conditions like cretinism, gigantism, obesity, and certain disturbances of sugar and lime metabolism. Aside from other evidence, states presumption is strong that pathological "new growths" may be similarly connected with them. A long table of conditions is given in which comparison is made between cancer and ductless glands, i.e., skin pigmentation, age, relation to sugar and lime, family incidence, occurrence and recurrence, rate of cell growth according to approximation to normal cells, relation to acidity, effect on stomach and pancreas, injury.

In correlating findings in a long list of nutritional disorders with well-known facts relating to ductless gland activity, he thinks a reasonable working theory can be obtained. Hyper- and hypo-function is formed in certain conditions, but he thinks the former is not a cause but merely a symptom; as, hyperthyroidism in Graves' disease; something harmful is back of the condition. Hyper-action is always secondary and can occur from congenital or accidental causes, disease, age, improper food, etc.

Growth is influenced by cell reproduction and ductless glands have an influence on cell reproduction. Embryonic cells grow and reproduce to a certain point, and then stop and take on special work. In the adult, these cells

must revert toward the fetal type, to a point where reproduction again is possible. The writer assumes that failure of some ductless gland causes this, and allows certain cell functions, such as reproduction, again to become possible in cells which have passed through the stages of reproduction, differentiation and specialization. He cites diabetes as an example when failure of the islands of Langerhans deprives certain specialized cells of some needed constituent, also failure of parathyroids, causing inability of certain cells to handle lime. Reference is made to Adami's observation that the closer cancer cells approximate normally developed cells the less malignant is the cancer, and the more the controlling gland fails, the easier for these cells to revert. The writer so far has applied this theory in practice in inoperable malignant growths. He determines what gland preparation to use by considering the embryonic type of the growth, thus, cancer of breast calls for pituitary gland extract because both are of ectodermic origin. Reference is made to former papers regarding considerations of dose, preparations, etc.—*C. L. Lowman, Los Angeles.*

THE RADICAL TREATMENT OF RHEUMATOID ARTHRITIS. M. J. Rowlands.  
*Lancet*, January 15, 1916.

Since rheumatoid arthritis is of a toxic nature, due to the absorption of toxins from some focus of infection located elsewhere in the body, the treatment should be directed primarily towards discovering and remedying the infective focus from which the pyogenic toxins have been absorbed. These toxins affect the nerve supply to the joint and surrounding muscles; fluid taken from the joint is sterile, as also is the blood; disorganization of the joints themselves is always a later phenomenon than the weakness and wasting of the muscles and the characteristic nerve pain. It is rare to find a rheumatoid condition accompanied by acute suppuration; the lesions are usually chronic, from which the absorption of toxins goes on for years. It is only in the early cases that removal of the source of infection will at once cure the condition; in the cases of longer standing the toxemia itself must be treated, and for this purpose Rowlands claims that vaccine-therapy has proven of great assistance. Ontogenic vaccines should always be prepared, the use of stock cultures being of little avail. The pathogenic organism can sometimes be isolated only with considerable difficulty. In such cases it is often possible to discover it in the urine, and this should always be examined if the organisms are not readily obtained elsewhere. The dosage depends upon the type of case as well as on the individual features in the patient, such as age. In old people care must be taken to avoid unpleasant reactions. In fairly acute cases an initial dose of five million may be given if the organism is a streptococcus, pneumococcus or a diphtheroid bacillus, and the subsequent doses increased according to the reaction. With the bacillus coli ten million may be given in acute cases and in the chronic cases five times these doses.

The arthritic reaction is an important guide as to subsequent doses employed; there should be a slight exacerbation of the joint symptoms, such as swelling, heat and pain. If the patient is kept at rest this soon subsides; cold applications give relief from the pain.

With subsidence of the reaction the patient usually reports marked improvement. There should be an interval of seven to ten days between the injections, and where there is very marked improvement this may be increased to fourteen or twenty-one days. The treatment should be continued for at least one year. The usual forms of treatment should be administered simultaneously with the vaccine-therapy, including attention to the general condition, removal to a bracing climate, if possible, massage, baths, tonics and removal of sources of worry.—*Robert B. Cofield, Cincinnati.*

## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

ONTOGENIC AND PHYLOGENIC SIGNIFICANCE OF CERVICAL RIBS. Capitan. *Bull. de l'Académie de Médecine*, December 21, 1915, LXXIV, No. 51.

The compilation of cases of supernumerary ribs attached to the fifth, sixth, and especially to the seventh, cervical vertebrae is of importance, not only to the pathologist, but also in the light of evolution; a significance also long recognized by teratologists and zoölogical anthropologists. He cites 200 cases.

Phylogenesis teaches that the first vertebrates that appeared on the earth were fishes provided with a pair of ribs, certain reptiles and lizards, a pair of ribs to each vertebra. Birds, the ostrich, etc., have cervical ribs like the crocodile.

Among the viviparous the first rib is bifurcated, one branch being inserted into the seventh cervical vertebra and the other into the first dorsal.

In man one stage back of fetal life, the embryo has twenty-nine pairs of rudimentary ribs, therefore seventeen must disappear before birth. The ribs attached to the seventh cervical vertebra disappear last. The thoracic cage in mammals is much more elongated in the embryo than in the adult. The author thinks that a period may come when the human chest will be less developed than it is today.

Many examples are cited of seventh cervical ribs, often well developed. Sixth, fifth, fourth, or third cervical ribs are rare, and when they exist are rudimentary, often only a band of fibrous tissue.

These cervical ribs have a pathogenic significance. They act mechanically, and may compress the brachial plexus or the vessels behind the clavicle, the symptoms produced ranging from simple constriction to gangrene from compression. Often there are accompanying anomalies in other parts of the skeleton, such as scoliosis, supernumerary thoracic ribs, division of the vertebral bodies, etc. Sclerosis of the cord, progressive muscular atrophy and club-foot are frequently seen in these cases, and there seems to be a predisposition to osteomyelitis.—*Daniel La Ferté, Detroit.*

## VIII. TRAUMATIC LESIONS, FRACTURES AND DISLOCATIONS.

TREATMENT OF COMPOUND FRACTURES OF THE LEG. E. Bamberger. *Münchener med. Wochenschrift*, November 16, 1915, No. 46.

In the treatment of compound fractures of the leg, Bamberger had excellent results with the plaster applied above and below the fracture and joined by irons, followed by extension later. The one objection was that frequently there was a backward displacement of the upper end of the lower fragment. To overcome this, a piece of sheet iron was fixed to the upper segment of the cast and so bent that it extended over the site of the fracture like the arm of a crane. By passing a sling under the upper part of the lower fragment and attaching it to the suspension base so formed, which has a certain amount of spring force, a constant lifting pull could be exerted and deformity prevented.—*Frank D. Dickson, Philadelphia.*

CONTRIBUTION TO THE STUDY OF VERTICO-TRANSVERSE FRACTURES OF THE NECK AND BODY OF THE ASTRAGALUS. Raoul Baudet. *Rev. de Chir.*, August, 1914—November, 1915, Nos. 8-9.

The author reviews the literature and discusses the X-ray appearances. He regards direct violence as the cause of this fracture. It is most common in young, adult males. The author describes the mechanism of the fracture and

makes a careful differentiation of the symptoms in cases of fracture of the neck and of the body, with and without displacement. In diagnosing he lays particular stress upon the varus position of the foot.

The cases may be treated by (1) simple reduction; (2) reduction by the open method; (3) reduction by reposition of fragments; (4) astragalectomy. Wherever possible, after X-ray examination, he prefers the first method, although the other methods also have their place in certain cases.

This is a very careful article, with much detail, and little short of a translation will do justice to it.—*Daniel La Ferté, Detroit*

COMPLETE SEPARATION OF HEAD OF FEMUR IN SMALL BOY; TREATMENT AS FOR CONGENITAL DISLOCATION. A. Broca. *Presse Médicale*, December 9, 1915, XXIII, No. 60.

Broca describes a case in which he found a complete separation of the epiphysis of the head of the femur in a child. It had been mistaken by previous physicians for a dislocation.

Checking his work by the use of the X-ray, he was able to reduce the displacement under chloroform by using the ordinary manipulations for congenital dislocation of the hip. After reduction he placed the thigh and pelvis in a plaster-of-Paris spica, as for the treatment of congenital dislocation. The result was good.—*F. C. Kidner, Detroit*.

OPERATIVE TREATMENT OF DELAYED UNION OF FRACTURES. M. S. Henderson, *Railway Surgical Journal*, August, 1915.

Cases of delayed union of the femur, with much shortening, should not be subjected to severe procedures in an attempt to obtain lengthening by traction. Many fatalities have resulted from such operations. It may be better to use a metal plate in some of these cases than a bone graft, as they can, as a rule, be more quickly applied. In the tibia the sliding inlay graft was used with excellent results. In the humerus the inlay method gave better results than the intramedullary plug. A plaster-of-Paris spica, embracing the affected shoulder, arm, forearm, and wrist, is essential to the control after operation. A fracture of the humerus ununited for 14 years was successfully united in three months after an inlay transplant. In ununited fractures of the neck of the femur poor results were obtained in three cases, due to the breaking of the bone peg. This was probably due to poor selection of cases (with absorption of the neck) and too early discontinuance of a plaster-of-Paris cast. Bony union was secured in another ununited fracture of the neck of the femur by exposing the fractured surfaces, freshening them, and wedging in two transplants each two inches long, between these surfaces and abducting the limb, thus holding them securely in place. A plaster-of-Paris spica from chest to toes held the limb abducted.—*M. S. Henderson, Rochester, Minn.*

END-RESULTS IN FRACTURES. M. S. Henderson. *Railway Surgical Journal*, September, 1915.

The orthopedic surgeon's fracture clinic is very essentially different from the fracture clinic of the surgeon handling the recent fractures produced in large industrial plants. The paper is based upon 180 records of bad end-results in fractures seen in the orthopedic division of the Mayo Clinic. Twenty-three involved the elbow; 67, the tibia and fibula (30 of these coming because of non-union and 15 because of ankle-joint involvement); 25 the humerus, and 45 the femur. The number of non-unions in this series and a

review of their histories emphasizes that inadequate fixation, too free handling to determine whether union was present or not, too early weight-bearing in the leg fractures and too early function in the arm fractures, were the chief causes of failure to unite. Syphilis could not be blamed for a single non-union. Ununited fracture of the neck of the femur was often caused by no treatment being instituted at the time of injury because no diagnosis of fracture was made. In selected cases of ununited fractures of the neck of the femur, nailing or the use of the bone peg was advised. In fractures of the shaft of the femur, too early weight-bearing was the cause of the non-union. After Pott's fracture, the common deformity was a valgoid one. This may be largely prevented by using the outside iron, inside T-strap, and raised inner side of the sole, as early weight-bearing with no support, was undoubtedly just as much a cause in the production of this deformity as poor reduction of the fracture. Poor results in fracture of the elbow were mostly due to the fact that the hyperflexed position was not used to maintain the reduction. The review of the histories brought out the fact that inadequate after-care was more often the cause of poor results than the primary or active care.—*M. S. Henderson, Rochester, Minn.*

**A NON-FATAL FRACTURE OF THE AXIS.** Frederick W. O'Brien. *Boston Medical and Surgical Journal*, January 20, 1916.

The author writes of a seven-year-old boy who fell from a tree, striking on his back.

A skiagram showed fracture of a lamina of the axis. There were no symptoms but the following:—the patient could not voluntarily turn his head except by means of the hands, and pain was produced by pressure over the second and third vertebrae.

A support was worn for five weeks, after which an X-ray negative showed good union. The child now goes about as well as he did before the accident.—*H. A. Pingree, Portland, Maine.*

**TRAUMATIC DISLOCATION OF THE HIP JOINT IN A CHILD.** Harry Platt and H. M. von Mengershausen. *Lancet*, January 8, 1916.

The authors report a case of posterior dislocation of the head of the femur in a child aged six years, due to a fall. They also refer to 29 cases collected from the literature by Boehnke. In this series there were 23 posterior and 7 anterior dislocations. In most instances an open operation was necessary after three weeks had elapsed, although in two cases (quoted by Endlich) reduction was obtained by manipulation six and a half weeks and three months after the injury, respectively. On the other hand, bloodless reposition failed in two cases which had existed 14 days only.

The chances of success in either method in long-standing cases will depend upon the training and experience of the operator in dealing with congenital cases.—*Robert B. Coffield, Cincinnati.*

**FRACTURE OF THE VERTEBRAE WITHOUT CORD SYMPTOMS.** Percy Willard Roberts. *Surgery, Gynecology and Obstetrics*, February, 1916.

Roberts' brief article is merely a clinical report of cases of fracture of the vertebrae without cord symptoms. It supports other men's findings relative to fracture of the vertebrae in which cord symptoms have not existed, also that it is very likely that many fractures exist which have been undiscovered. He points out localized tenderness as an important symptom. It is not safe to depend upon the X-ray findings, because fractures may be so placed as to be entirely obscured by the overlying bone. If external mechanical support fails



to give relief, bone graft is suggested. The kyphosis of this condition differs from the kyphosis of Pott's disease in that it produces a long sweeping curve. The history of several cases is given, also eight cuts illustrative of the theme he presents.—*William Jackson Merrill, Philadelphia.*

MODERN TREATMENT OF FRACTURES. A. Ziegler. *Korrespondenz-Blatt f. Schweizer Aerzte*, December 4, 1915, XLV, No. 49.

1. The one great requirement for the treatment of fractures is restitution of function as soon as possible.

2. Avoidance of long-continued rigid fixation.

3. That all extension apparatus should be devised in physiologically rational consideration.

4. Further important points are those summarized by Zuppinger and Christen. "Zuppinger-Christen-Allgemeine Lehre von den Knochenbrüchen, Leipzig-Vogel, 1913." In addition to those points, the following from Zuppinger and Christen:

a. Reduction to be accomplished as early and as perfectly as practicable.

b. As complete fixation as possible—under minimum muscle strain—therefore in semi-flexion.

c. All possible freedom for limited muscle play which will not interfere with the fixation.

d. Whenever practicable, permit as early massage and active movements as possible—the older the patient, the earlier these are to be begun.

These postulates, which are based on the mechanics of fractures, as well as physiology and pathology of muscle, are to be borne in mind in the treatment of all fractures without exception.

Advantages of a:

1. Disappearance is preventive of hematoma which, if permitted to occur, may occasionally produce lateral displacement.

2. In this connection, the advantage of extensive apparatus over a mere retaining device is especially manifest and valuable, i.e. greater ease of absorption of hematoma.

Advantages of b:

The advantages of semi-flexion are best exemplified in the special apparatus devised by Bardenheuer and Zuppinger. This device can be obtained from M. Scharer, Bern, and is under state patent.

1. Simplicity of application and avoidance of dependence on outside assistance.

2. Carrying of the principles of muscle play to semiflexion of all joints.

3. Guarantee of as early passive and active movements as possible.

4. The power of extension can be easily regulated.

5. In the cases of fracture of both thigh and leg, this apparatus can easily combine with Steinmann's needle extension apparatus.

6. The same apparatus can be used not only for extension of the thigh as well as of the leg, but also in adults as well as in children.

7. After the weight has been taken off, the apparatus may be used as an extension splint, still maintaining the semiflexion.

8. The injured part permits an easy access and is thus under perfect control with regard to inspection, palpation, and massage.

9. X-ray examination is easily accomplished with this apparatus in position.

10. Stability, solid construction, and moderate price.

The article is well illustrated by descriptive cuts of the apparatus in different positions in use, also in combination with Steinmann's needle apparatus.—*John Dunlop, Washington, D. C.*

## X. WAR SURGERY.

ARTIFICIAL SUBSTITUTES AFTER AMPUTATION OF ARM. Biesalski. *Münch. med. Woch.*, November 2, 1915, LXII, No. 44.

Biesalski believes that the best substitute for an amputated arm is the stump itself, provided enough is left, and the individual is young and willing to learn to use it. Even if an artificial arm is worn an effort should be made to do as much as possible with the stump, as it will aid greatly in securing a maximum of use from the arm worn.

For those who use the stump, an arm of the Bade type can be used for cosmetic purposes. This arm costs only 5-6 marks and consists of a celluloid socket for the upper arm to which are attached steel rods which run to a circular piece of wood representing the wrist joint. From this five metal rods extend to form the fingers. The whole apparatus is covered with stockinette and padded with felt. Such an arm looks well and is quite useful for small things.

It is important to save the elbow joint where possible, as it can be used to hold things, such as tools, etc. In high amputation of the arm an earnest effort should be made to prevent the shoulder joint from becoming stiff by the use of massage and passive motion, for a good movable shoulder enables an artificial arm to be applied, which is quite useful. This would be impossible if the shoulder joint were ankylosed.

This article describes a variety of artificial arms which permit of the removal of the forearm and hand and substitution of various tools and appliances for convenience in working. Also a type of arm which permits motion at the elbow joint or stopping of this joint. In general, the author believes by a careful study of the capabilities of the patient in every case a useful arm can be applied. All such arms should be reasonable in price, well made and as simple in mechanism as possible, so that they may be taken care of locally and not have to be sent to the home shop for repairs.—*Frank D. Dickson, Philadelphia.*

DECAPITATION OF THE ASTRAGALUS TO CORRECT TALIPES EQUINUS CONSECUTIVE TO WAR WOUNDS. D. de Fortunet. *Presse Médicale*, January 6, 1916, XXIV, No. 1.

Fortunet has treated two cases of traumatic equinus, in which the foot was locked in the equinus position by injuries following a gun-shot and sepsis, by cutting off the head of the astragalus, rather than by its removal. He says the operation is simpler than astragalectomy and the results are as good.—*F. C. Kidner, Detroit.*

GUNSHOT AND SHELL WOUNDS OF THE SPINE AND SPINAL CORD. P. Frangenheim. *Münchener med. Wochenschrift*, October 26, 1915, No. 43.

Frangenheim reports 25 gunshot wounds of the cord operated on, with 9 deaths. Four were in the cervical region, 13 in the dorsal, 6 in the lumbar and 2 in the sacral. Wounds of the face almost always involved the cervical spine, and because of the frequent interference with breathing and swallowing and almost certain infection, it was found advisable to remove the bullet and evacuate hematomas as soon as possible in these cases. In all cases of spinal wounds a careful X-ray was necessary to locate the site of injury, as the clinical signs could not be depended upon to locate the segment involved, probably because of the accompanying concussion.

From the experience of the author and his colleagues they believe that, because of the difficulty of making a diagnosis from clinical evidence and the

difficulty of securing an X-ray early, that in all cases of suspected injury to the cord an exploratory laminectomy should be done as soon as possible, and if evidence of injury is found, the dura opened and whatever is necessary done. Frangenheim believes the only hope of cure lies along these lines.—*Frank D. Dickson, Philadelphia.*

**AN ARTIFICIAL SHOULDER-JOINT FOR USE IN A WOBBLING JOINT WITH A LARGE HUMERUS DEFECT.** J. Lewy. *Münchener med. Wochenschrift.* November 16, 1915, LXII, No. 46.

When the head and upper part of the humerus has been destroyed there results an instability of the shoulder-joint. Consequently when an attempt is made to use the injured hand and fore-arm, it is impossible as the arm practically collapses and gives no fixed point or fulcrum. Lewy describes an apparatus to give the desired stability of the shoulder-joint. It consists of a celluloid cuff for the arm attached by hinge-joints to a celluloid piece fitting across the chest and over the shoulder of the involved side and a cuff on the forearm. There is a lever arrangement which holds the arm abducted when the elbow is flexed, if desired, and allows it to fall to the side when extended. With such an apparatus almost complete use of the fore-arm and hand can be secured.—*Frank D. Dickson, Philadelphia.*

**A TEMPORARY ARTIFICIAL LEG CONSTRUCTED OF LINOLEUM.** H. Neuhäuser.

*Münchener med. Wochenschrift*, November 16, 1915, LXII, No. 46.

Neuhäuser describes a method of providing a temporary artificial leg of the peg variety. The socket is made of linoleum 7 mm. thick attached to a disc of wood by a circle of sheet iron. Into this disc is fitted a stout wooden peg of the desired length and thickness. The socket is padded and held together by laces or straps. Such a leg has proven very satisfactory and is very cheap.—*Frank D. Dickson, Philadelphia.*

**AMPUTATION STUMPS AND TEMPORARY ARTIFICIAL LIMBS.** K. Nieny. *Münchener med. Wochenschrift*, October 26, 1915, LXII, No. 43.

The author urges the use of a temporary substitute for artificial limbs as soon as possible after amputation. This enables the patient to get about sooner, prevents atrophy of the stump, and practice in locomotion is given while waiting for the permanent limb. Nieny, at the base hospital, treats his stumps according to the method recommended by Hirsch, which he believes hastens weight-bearing. It is as follows:

1. As soon as the wound permits, the stump is treated daily with massage and baking and bathed in formalin.
2. Gradually increasing weight-bearing is started as soon as possible by resting the stump on a chair and daily increasing the amount of weight it is allowed to bear.
3. The stump is frequently tapped with a wooden hammer padded with felt.
4. Active and passive motion is given.
5. As soon as possible a temporary support is applied and walking permitted.

Various types of temporary support are described. At first a crutch with a shelf on which the stump may be rested can be used. Later a Thomas knee-splint, where the weight is taken by the tuberosity of the ischium, can be used. As more pressure can be borne, a peg-leg of bamboo attached to a plaster socket, which in long stumps may be split and laced, makes a very satisfactory form of support.

By such methods a very satisfactory temporary support can be devised, and the patients are soon able to be useful. The objection raised by some that it is difficult to use an artificial leg with a movable knee-joint after wearing a peg-leg, the author does not believe has been supported by experience.—*Frank D. Dickson, Philadelphia.*

ORTHOPEDIC WORK IN A WAR HOSPITAL. Robert B. Osgood. *Boston Medical and Surgical Journal*, January 27, 1916.

In this article Osgood has described his work in a French war hospital. He has taken up systematically the different fractures of the limbs and those involving the large joints of the arms and legs.

He gives a detailed description of numerous mechanical appliances used for the retention of fragments, the immobilization of joints, and the exercise of those in which motion is desired. Of all the apparatus used, Osgood gives that containing plaster-of-Paris the first place.

The different appliances are most ingenious, and in order to fully appreciate them one must see the pictures and the accurate descriptions.

It seems to the writer that those who have to deal with accident services in hospitals would do well to read the entire paper, which does not waste any time or space with theories, but gives the facts as Osgood observed them in actual cases in the wards and operating rooms.

It seems remarkable that with all the busy work-hours put in by the Doctor, he should have found time or energy enough to compile all the records and photographs for his report.—*H. A. Pingree, Portland, Maine.*

THE TREATMENT OF COMPOUND FRACTURES OF THE UPPER EXTREMITIES, ESPECIALLY OF THE HUMERUS, BY EXTENSION SPLINTS. W. Purrrucker. *Münch. med. Woch.*, November 16, 1915, LXII, No. 46.

Purrrucker states that the principal essentials in the treatment of compound fractures in war are: that the part be put at rest, that the wound be accessible, that the dressing be of such a type that transportation is as convenient as possible.

For this type of injury in the arm the author believes combined extension and suspension is the best form of treatment. Extension keeps the fragments in place and suspension relieves pain and has favorable influence upon the circulation. The latter point the author considers very important in combating infection. Purrrucker uses a Cramer wire splint twice as long as the arm. This is bent upon itself at the middle. The bent end is moulded to fit the axilla, the arm and forearm are bandaged to the upper piece with the elbow in slight flexion, while the lower piece is left free, but follows in a general way the direction of the upper piece. The ends of the lower section are bent over and used for the attachment of rubber bands which, being secured to the arm below the injury, exert constant extension. The arm and splint are suspended from the hand to a support above.

With this dressing the author claims the pain disappears almost at once, adjustment of the fragments is easy and, because of a favorable influence on the blood stream, infection rapidly subsides.—*Frank D. Dickson, Philadelphia.*

USE OF SUBCUTANEOUS CATGUT SUTURE OF THE PATELLA IN WAR. Riedel. *Münch. med. Woch.*, 1914, No. 50. Abstracted in *Zentralblatt für chir. u. mech. Orthopädie*, July, 1915, p. 156.

Riedel recommends the subcutaneous suture, which is best done soon or immediately after the injury, when the hematoma is still slight. The suture will itself stop further bleeding.

The operation is done under ether in order to eliminate the resistance of the quadriceps, and is done in the following way. After the puncture of the joint a  $1\frac{1}{2}$  cm. longitudinal incision is made above the patella through the tendon of the quadriceps into the upper recesses. A strong handled needle is pushed through this incision *behind* the fragments and perforates slightly below the lower edge of the patella the ligamentum patellæ and skin, which is incised about 1 cm.

Six catgut strands are threaded into the eye of the needle and the needle is pulled back; then the needle is again pushed through, but this time *in front* of the fragments out of the lower incision. The ends of the six catgut strands are threaded and pulled back, while an assistant presses the upper fragments downward. The strands are tied in the upper wound. Plaster cast for four weeks, followed by a light ambulatory cast.—*C. H. Bucholz, Boston.*

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THE CARE OF CRIPPLES RESULTING FROM THE WAR, ESPECIALLY IN REGARD TO THE QUESTION OF PROTHESIS. J. Riedinger. *Archiv f. Orth., Mech., u. Unfallchir.*, 1915, XIV, 2 H.

This article describes in detail and illustrates the method of making prostheses to take the place of amputated fingers, arms and legs. A great deal of skill and ingenuity is shown on the part of the surgeon and instrument maker. Any one interested in the making of such apparatus would do well to consult the original article.—*George I. Bauman, Cleveland.*

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TWELVE COMMANDMENTS FOR PREVENTION OF CRIPPLING IN WAR INJURIES. Ritschl. *Zentralblatt f. chir. u. mech. Orth.*, July, 1915, p. 145.

In analogy to the Ten Commandments, Ritschl wants to keep the military surgeon reminded of certain important orthopedic facts which are known to the orthopedic surgeon, but often enough not sufficiently valued and recognized by all who have to do with injuries and other infections of joints.

Ritschl emphasizes the importance of correct position and avoiding too long fixation. He advises special attention to the extensors, as the deltoid and quadriceps. He refers to the importance of massage, hot air, etc., as effective means for the absorption of hematoma. On the whole, his advice seems not untimely at the present moment, and should be kept in mind for all the time.—*C. H. Bucholz, Boston.*

---

GUNSHOT FRACTURE OF THE LONG BONES. Channing C. Simmons. *Boston Medical and Surgical Journal*, February 17, 1916.

Simmons gives us a part of his experience in a British hospital in France during the past summer.

The paper deals principally with the fractures of long bones of the limbs. There were more fractures of the upper than of the lower limbs and more of the left than of the right.

In his experience the small skin wounds without much laceration or comminution were seldom followed by sepsis, while large external wounds and extensive damage to bone and muscle generally led to a septic condition.

Simmons describes many different splints and braces used in the British army, but favors plaster-of-Paris as the best material for retention purposes in fracture work.

He expresses some dissatisfaction because he was unable to follow most of his cases through to the end.

The article closes with an analysis of the cases under observation.—*H. A. Pingree, Portland, Maine.*

# The American Journal of Orthopedic Surgery



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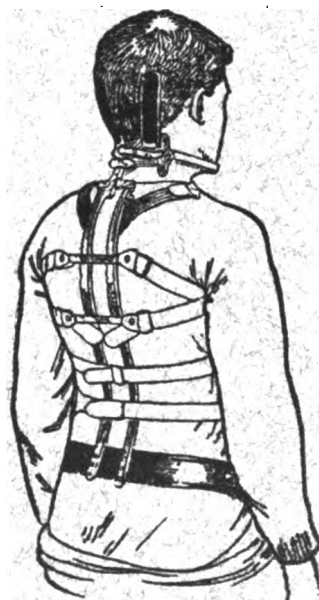
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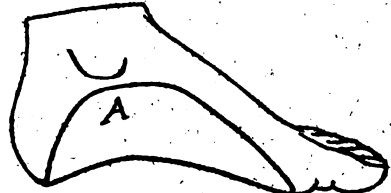
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Shows the under surface of the brace and the outer flange. B—The calcaneocuboid articulation. C—The extremity of the fifth metatarsal bone.

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# *The American Journal of Orthopedic Surgery*

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## AMERICAN ORTHOPEDIC ASSOCIATION.

PRESIDENT'S ADDRESS, MAY 9, 1916.

BY CHARLES F. PAINTER, M.D., BOSTON, MASS.

Gentlemen; members of the American Orthopedic Association and guests:

I take pleasure in welcoming you to this, the first Scientific Session of our Thirtieth Annual Convention, and in addressing you I purpose to speak on the subject of reorganization within the Association and to do so quite briefly, and even sketchily, in the hope that if there should seem to be any merit in the suggestions made they may be considered more carefully elsewhere.

More than thirty years ago, before this Association was organized, the need for more special and extended knowledge than that possessed by the general practitioner in surgery, and later in medicine, was beginning to be felt. Individuals here and there were acquiring a reputation for particular skill in certain lines and it became the *fashion*, as much as anything else, for the public to seek them out. The line of cleavage so far as orthopedic surgery was concerned, came along the borderland diseases in the treatment of which mechanical devices were found desirable, and those who possessed mechanical ingenuity in devising and adjusting apparatus, and patience and resourcefulness in managing chronic patients became known as Orthopedic Surgeons. Even those who were supposed to stand out from their fellow practitioners only because they possessed this superior mechanical instinct



and were, therefore, qualified to handle chronic bone and joint diseases better than the general surgeons, soon became infected with the virus of operative furor, and the orthopedist became less and less of a mechanotherapist and more and more of an operative surgeon. All through the thirty years of existence of this Association the pendulum has been swinging back and forth between these two extremes. Latterly certain conditions have been added to the realm of orthopedics which have been purloined from the field of the internist, viz: non-tuberculous arthritis, largely because it is so essentially chronic that its best management is secured through the medium of men accustomed to deal with chronic processes. During this period, covering the life of the Association, the most distinctive policy of the organization has been the education of various large medical centres up to the idea that the orthopedic surgeon had something to offer by way of solution of those chronic problems occurring in the practice of surgeons and internists. This has been accomplished chiefly by meeting in cities where men who were qualified to do this sort of practice had established themselves. This policy has been merely an advertising propaganda. As a result of this kind of activity on the part of the Association, the general public has been educated to a better knowledge of the possibilities of treatment for orthopedic diseases, and through the establishment of chairs for the teaching of the specialty in medical schools the profession has been equipped with a better understanding of such subjects.

Along with the growth of specialization in all other lines of medicine, as well as in orthopedics, certain very serious defects have developed. The chief of these are concerned with the attitude of the specialist toward the disease manifestation he treats, and involve a failure on his part to recognize the fact that there is a patient behind the particular abnormality he attacks. Furthermore, the intimate interrelations of disturbances which lie in the fields of adjoining specialists make it a hardship for a patient, be he rich or poor, to suffer from certain lesions. Concentration of specialists in the same office building, the association together in a business way of a number of men doing work in various special lines is tending to obviate to some extent certain of these defects.

However, the time has come, or is at any rate near at hand when the good resulting from the development of specialization must be winnowed from the bad effects which follow in its wake, and it seems as though the occasion had arisen for this Association to take cognizance of this fact and make its organization effective toward the adjustment of specialization to the newer demands which are bound, it seems to me, to be made upon it.

It is no longer particularly necessary to put the stamp of authenticity upon the kind of work a member of this Association offers to do in any community he may choose to settle in, by holding our annual meeting once or twice in his home town, and showing the profession there that the orthopedists possess a real organization and have something to contribute to the welfare of that community.

We should go further. We must institute and foster more collective investigations, similar to that which has been so thoroughly done by the Committee on Scoliosis. We must make efforts to standardize the teaching of orthopedic surgery in our various schools, where it is now taught in widely different ways. I feel that in some schools at least, if not all, it is not clearly enough affiliated with the teaching of the surgical departments, and that two good purposes would be served if the association were closer; in the first place the teaching would savor less of attempting to prepare for a specialty rather than to train for general practice and the student would receive a better, because a more useful, fund of information concerning orthopedic troubles; and in the second place, the surgical department might be benefited by the instillation of a little tincture of the orthopedist's viewpoint into general surgical teaching.

I think this is a matter that might be taken up through our Association, and by showing our interest in medical teaching and our willingness to have a proper valuation put upon instruction in the specialties, our own among them, that we should be contributing in a very real and practical way to a wider dissemination of knowledge on orthopedic subjects.

I am convinced that as an Association we have striven too long to promote the individual interests of the Association members, and are now finding that such an object has ceased to be a vitalizing influence in this organization. It never could be expected to be such, so far as that is concerned, because it is too narrow and selfish a motive ever to serve as the activating principle of a society. It could only *seem* to be so when the specialty was in its infancy. We have outlived that period, and in order to justify our existence as an Association, we must now seek to express ourselves in broader lines of activity.

Chaos has long reigned in the classification of the chronic non-tuberculous joint lesions. There is now better ground for establishing a satisfactory classification than ever before, and I believe that the Association could render a very valuable service to the medical public at large, as well as to their patients, if, through a committee, they were to assemble the data, and by constructive and destructive criticism

formulate a scientific basis for the diagnosis of conditions coming under this heading. Similarly, in regard to the employment of bone-grafting in the various places and for the varying conditions for which it is being employed, the Association might put at rest, through a dispassionate scrutiny of the experimental work carried out by variously qualified investigators, as well as of the practical results obtained, the much mooted questions concerning the rôle played by the graft when transplanted, as well as to the clinical applicability of the procedure.

These are a few of the matters upon which it seems to me the Association could focalize its resources. In doing so it would have the satisfaction of accomplishing things of immense and far-reaching value to the public and doing it in a way that will result in constantly augmenting the influence of the Association. We have an active body of young men, thoroughly interested in the special line of work in which they are engaged, a large number of whom are banded together in smaller associations within the larger one for their mutual benefit in clinical research, and the potential of their united efforts is great. Thanks to the activity of some of our members, our JOURNAL is in a position to promote the interests of the Association in a much more positive way than ever before and deserves the active support of every member.

It is time to change our policy, it seems to me. We must have a little different organization to make any new policies decided upon effective. If we have emerged from the stage of merely introducing a new brand of medicine to the public and from trying to persuade people to take it; if we feel the need for our own good as an Association as well as for the welfare of those scientific medical interests to which we are committed, of concerted action along the broadest lines of altruistic professional endeavor; if we are satisfied that we have done well to substitute for the repository of our annual output of orthopedic literature an active monthly journal, it seems to me we should modify the machinery of organization in order to take on satisfactorily these new functions. Instead of electing your president to serve for one year and act merely as a presiding officer at the meeting to be held at the end of that year, I believe some such plan as the following would work well. As it is now, every member is slated to become your president, if he lives long enough. There is no incentive to shape any policy for the Association on the part of either the President or the Executive Committee, for the only time the former has any opportunity to promulgate his ideas is on the occasion of his "swan song" performance, while the executive committee meet to listen to his proposals for the annual meeting, acquiescing in anything he suggests because they say "every dog has his day," and the occa-

sion of the annual meeting over which he is to preside is "*Der Tag*." I believe the dignity of the office could be enhanced and the purposes as above outlined could be brought to fruition, if there were a president-elect chosen the year before he is to serve, and if the executive committee were not made up entirely of ex-presidents, but was, partly at least, composed of future presidential timber. With such an organization some consistent policy might be originated and carried out through a series of years and not be at most a "flash in the pan" at the end of one administration.

It remains only for me to say one word of the loss that the Association has sustained in the death of two of our ex-presidents, Drs. Townsend and McKenzie. In our executive session I am sure we shall hear, from those who were closest to them in friendship and professional affiliation, an appreciation of their lives which we may all carry away as in some manner an inspiration for ourselves. Two more opposite characters it would be hard to find within the limits of lives distinguished for uprightness and probity, and from both each one of us may learn much which will be to our advantage.

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## SUBASTRAGALAR ARTHRODESIS IN LATERAL DEFORMITIES OF PARALYTIC FEET.

BY DE FOREST P. WILLARD, M.D., PHILADELPHIA, PA.

THE correction of lateral deformity of the foot due to infantile paralysis is difficult both to obtain and to maintain. Especially is it so in cases in which there is paralysis of a group of lateral muscles with overaction of the opposing group. Not only does the pull of the strong muscles draw the foot into varus or valgus position, but weight-bearing in the deformed position tends constantly to increase and make permanent the deviation. Even if these cases are seen in the early stages of deformity it is difficult to hold the foot in its proper position with the strongest retentive apparatus. In the later stages, when contraction of the tendons and ligaments on the shortened side occurs, proper position by braces alone is practically impossible, and operative measures which correct the deviation and firmly fix the foot must be resorted to. There is also another group of cases in which the paralysis of both the

lateral groups of muscles is severe and the foot is practically flail-like. From weight-bearing this type of foot may show as bad lateral deformity and may need operative correction as much as the other.

This lateral deviation of the foot takes place, not in the ankle-joint, where the astragalus, if normal, is firmly wedged between the malleoli and held by strong ligaments, but in sub-astragalar articulations. These joints are usually described in the text-books as two separate joints, one between the scaphoid and astragalus, and the other between the os calcis and astragalus, but for practical purposes there is one joint only, the upper articulating surface consisting of the astragalus, and the lower, of the scaphoid anteriorly and internally, and the two or three articulating surfaces of the os calcis posteriorly. In both varus and valgus deformities, rotation of both the scaphoid and os calcis on the astragalus occurs.

Various surgical measures have been used to correct this deformity. Tendon transplantation, tendon fixation, insertion of silk ligaments and arthrodesis have all been advocated. The ultimate outcome of tendon transplantation alone, although often satisfactory, must always be uncertain. In transplantations, proper muscle balance is difficult to obtain, and unless this muscle balance is perfect, recurrence of the deformity may be looked for. Tendon fixation and insertion of silk ligaments limit extension and flexion of the foot as well as lateral motion, and in many cases of partial paralysis are not advisable for this reason. Arthrodesis of the astragalo-scaphoid joint, as illustrated by the work of Soule and Jones, has often been successfully done, but the ankylosis of this one articulation has seemed to us in many cases to be insufficient, and as a rule more applicable to cases with marked dropping of the anterior part of the foot.

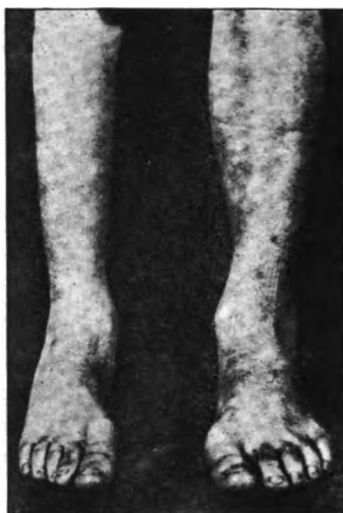
The operation which is now used in the clinics of the University and Orthopedic Hospitals for correction of this deformity was devised by Dr. G. G. Davis about nine years ago. Nieny in Germany and Jones in England have independently described a similar procedure. The operation consists of an arthrodesis of not only the astragalo-scaphoid, but also of the astragalo-calcaneal articulations, and in severe cases of varus, perhaps the calcaneo-cuboid joint as well. It is more than an arthrodesis; it is the welding together of the adjoining surfaces of three bones,—the astragalus, the os calcis and the scaphoid. In this operation there is no careful dissection of the cartilaginous joint surfaces. Instead, there is a rough digging and gouging of both the articular areas, and also the bony surfaces between them, with no attempt at removal of the fragments that are torn loose. The more promiscuous and rough the

gouging, the more reaction is set up and the more solid the resultant union of the posterior tarsus. The astragalus, the scaphoid and the os calcis become one solid bony mass, movable in the antero-posterior directions, but immobile for side movements. No shortening of the foot occurs. A rigid point of attachment is given for the unparalyzed muscles. No foreign substance is left in the tissues. Future growth of the leg does not impair the efficiency of the operation and the use of further operative procedures on the foot, if such become necessary, is not interfered with.

The method of performing this arthrodesis is as follows: Two incisions are made, one on the inner side of the foot, about a finger's breadth below and in front of the internal malleolus, on the level of the sustentaculum tali; the other on the outer side immediately below the external malleolus. Both incisions are parallel to the long axis of the foot, and are about an inch and a half in length. Through the inner incision the posterior tibial tendon can be exposed and drawn aside, and the astragalo-scaphoid joint and the joint between the astragalus and sustentaculum tali can be reached. With a small curved gouge these joint surfaces, together with the lower surface of the astragalus and the upper surface of the os calcis which lie between them, are roughly dug up. Through the external incision the sheath of the peroneus brevis and tertius can be opened and these tendons drawn aside. The joint between the os calcis and astragalus can now be easily found by pushing the gouge through from the inner incision. The outer portion of the adjoining surfaces of the os calcis and astragalus is thoroughly roughened. The completed operation should give two rough denuded bone surfaces with numerous loose fragments of bone and cartilage lying between them. The upper of the two surfaces is the interior and inferior surfaces of the astragalus, the lower, the posterior surface of the scaphoid and the entire anterior two-thirds of the upper surface of the os calcis. Only the skin wounds are sutured and the foot is fixed in a plaster-of-paris dressing extending to the knee. Great care must be taken to fix the foot in the proper position (the sole of the foot being at right angles to the line of weight-bearing). It has been our custom to remove the primary dressing at the end of one week, inspect the wound and replace the foot in plaster, again making sure that the foot is in proper position. The patient is allowed to walk in cast at the end of four weeks and the cast is removed in eight weeks, and unless the paralysis of the other portions of the leg demand it, no braces are put on. Bleeding during operation is never severe and post-operative oozing is easily checked by elevation of the foot.



**Varus deformity; before operation.**



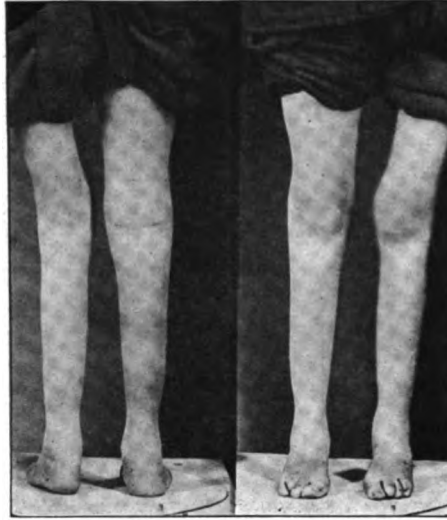
**Varus deformity; after operation.**



**Valgus deformity; before operation.**



**Valgus deformity; after operation.**



Valgus deformity; after operation.

As an example of the results procured by this operation, I wish to report eight cases of my own which were done either on Dr. Davis' service at the Orthopedic and University Hospitals or on my service at the Home of the Merciful Saviour. These results are confirmed by those of a much larger series of cases performed by Dr. Davis and the other members of his staff.

Of these eight cases seven were for the valgus deformity, and one for varus. In all cases there was some power remaining in the flexor or extensor muscles of the feet. In none of the cases was there any lateral motion in the ankle-joint due to deformity of the upper surface of the astragalus. The youngest case operated on was  $6\frac{1}{2}$  years and the oldest  $9\frac{1}{2}$  years. The length of time between the onset of the disease and the operation varied from 3 to 7 years. All the cases but one had before operation unsuccessfully worn braces to correct the deformity. In three cases tendon transplantation had been done without giving satisfactory correction. The first of the operations was performed  $2\frac{1}{2}$  years ago, the last six months ago. In all the cases firm ankylosis between the three tarsal bones occurred. In all the cases this ankylosis was present in eight weeks from the time of operation. In none of them has the deformity in the subastragalar region recurred. In one case of valgus, which was lost track of for about a year after operation and in which



the peronei were very strong, the deformity recurred, but the rotation took place in the ankle-joint and not in the subastragalar region. In all the cases but this one the patient has now a stable foot for weight-bearing. Two of the cases are now wearing braces, but these are required for paralysis of the muscles of the thigh and gluteal region and not for the foot condition. Two of the cases wore braces for several months after operation to insure good position of the foot. The other four have worn no support since the cast was removed. In one case of valgus which was paralyzed for a little over three years before operation, there has been seemingly some return of power in the tibial group of muscles.

The above cases have been selected to show the results of subastragalar arthrodesis when not combined with other surgical procedures. In many paralytic deformities of the foot, this operation can be used as a foundation for further correction. Tendon transplantation of overacting muscles, either at the time of arthrodesis or later, has been most satisfactory, especially in cases which show a tendency to lateral rotation at the ankle. In the flail type of foot, arthrodesis of both ankle and subastragalar joints insures a stable weight-bearing apparatus.

Most writers on the subject of arthrodesis advise against the use of this operation before the age of seven. But in the subastragalar joints firm bony union seems to occur readily at an earlier age. This may be accounted for by the fact that the bony surfaces of the astragalus and os calcis lying between the cartilaginous joint areas are denuded, and from these areas the bony bridges take their origin. In our clinics there are records of several cases that have had this operation before the age of six, and they have healed as quickly and as firmly as the older cases.

From a study of these and numerous similar cases which have been seen in our clinics it seems to us that subastragalar arthrodesis is the operation of choice in the cases of paralytic feet that show lateral deformity, but in which some muscle power still persists, and in which operations tending to interfere with motion at the ankle are not to be desired. The operation is short, safe and sure. There is no tendency to recurrence of the deformity, as is shown by the fact that in no case of Dr. Davis's large series has it been necessary to do the operation a second time. In suitable cases it may be combined with other surgical procedures, such as tendon transplantation or ankle arthrodesis. It does not prohibit later operations of any sort. It leaves the foot stronger and more stable, and in many cases it obtains the results for which all orthopedic operations of the foot strive—locomotion without deformity and without mechanical support.

## THE INTRAPERITONEAL INOCULATION OF ANIMALS; ITS DIAGNOSTIC VALUE IN ORTHOPEDIC SURGERY.

BY MELVIN S. HENDERSON, M.D., MAYO CLINIC, ROCHESTER, MINN.

THE diagnosis of tuberculosis places upon the surgeon considerable responsibility. Particularly does this apply to the orthopedic surgeon, the treatment of a tuberculous condition requiring in most instances prolonged supervision. Therefore any procedure that makes possible an exact diagnosis should be resorted to.

For the last three years it has been our custom in the orthopedic division of the Mayo Clinic to use as an aid in the diagnosis of suspected tuberculous cases animal inoculation tests. This procedure is an old one and has been generally used for years, but we believe not with the frequency in orthopedic surgery that it should have been. It is with the idea of presenting the practicability and the clinical value of the test that this paper is offered.

We have as a basis for this communication, records to January 1, 1916, of 143 patients who have furnished material for the test. A considerably larger number of tests have been carried out, for in some instances material was obtained two or three times from the same patient. The source of material was as follows:

1. The knee-joint, 80.
2. Abscesses, such as psoas, lumbar, etc., 23.
3. The ankle joint, 7.
4. The elbow, 5.
5. The wrist, 3.

The balance constitutes a miscellaneous group of hip joints, shoulder joints, osteomyelitis, dactylitis, tenosynovitis, etc. In forty instances tuberculosis was demonstrated at autopsies of the guinea-pigs used and in 103 negative results were obtained.

### THE KNEE JOINT.

Material for inoculation was obtained from the knee joint in eighty instances. The negative reports numbered fifty-eight and the positive twenty-two. Of the twenty-two positive results, seven may be put down as merely corroboratory of evident clinical conditions. Fifteen of these twenty-two positive results were more than corroboratory; a few were of exceeding interest and of distinct diagnostic value. Three cases are herewith cited.

CASE 103272, P. V., male, aged 10 months. Examination March 28, 1914. Two months before the child became fretful and cried if his left leg was moved. About the time of the onset of the knee symptoms he had a cough and bronchopneumonia was suspected by the attending physician. The left knee gradually swelled. At the time of our examination the lungs were negative. Above the patella was a marked swelling, which was red, fluctuating and appeared about to rupture. The diagnosis rested between tuberculosis and pneumococcus infection following pneumonia. The appearance of the knee and the age of the patient argued against a tuberculous joint. The roentgen-ray did not show involvement of bone. The suprapatellar pouch was opened and one-half tea cup of debris and pus evacuated from the joint. The wound healed by first intention. A saline emulsion of this material was injected intraperitoneally in a guinea-pig and gave a positive test. The baby was placed on a frame with the leg tied down in extension for one year. One and a half years later, the time of the last report, the knee was, to all appearances, perfectly well, though the child has used it very little as yet.

CASE 106405, Mrs. C. G. A. Examination May 14, 1914. Two years before this patient had had a sudden onset of pain followed by swelling in her right knee. She was subject to occasional sore throat. The trouble in the knee joint was steady though mild with exacerbations; some swelling persisted; occasional pains were also complained of in the right hip. The diagnosis rested between an ordinary infectious condition, presuming the focus to be tonsillar, and tuberculosis. The tonsils were removed and fluid aspirated from the right knee for inoculation. No relief followed removal of the tonsils. The guinea-pig test of the knee fluid was positive. Six months later, the knee symptoms increasing under rest, the joint was resected. The pathologist's report on this specimen was tuberculosis.

CASE 115698, F. S., female, aged 20. Examination September 22, 1914. The year before, her work for a time necessitated prolonged kneeling. Following this a little stiffness and swelling of the left knee occurred. At the time of onset she had an infection on the second left toe which rapidly healed. It was thought that the knee affection might be secondary to this. The complaint persisted, and during the next year three inoculation tests were carried out. The last one was positive.

It has been stated by some authorities, notably Robert Jones<sup>1</sup> and Sir Arbuthnot Lane<sup>2</sup> that internal derangement of the knee joint may be an etiologic factor in the production of tuberculosis of that joint. We have noted that occasionally a patient with a tuberculous knee will give a

past history suggestive of some mechanical derangement of the joint. In some it has been a quite definite record of locking, relieved by manipulation; in others, it was merely a catching. This in our experience has been, by no means, the rule. The following two cases are of interest as bearing directly on this phase of the etiology.

CASE 81603, B. B., male, aged 22. Examination March 18, 1913. This man had sustained a severe trauma to the right knee five months before. Roentgen-ray showed loose bodies in the joint. Effusion persisted in spite of rest. Aspiration was done and 5 ounces of clear serous fluid were withdrawn. Two c.c. were injected into a guinea-pig. Three weeks later three good-sized loose bodies were removed from the knee joint. Nothing abnormal beside the loose bodies was noted at the operation except that the infrapatellar pad was markedly congested. The patient's convalescence was normal. Two months later the guinea-pig died and autopsy showed tuberculosis. A recent communication from the patient reports full motion of the knee. His only complaint is that this knee tires a little easier than the other.

CASE 136312, P. A., male, aged 52. Examination July 20, 1915. Typical history of loose internal semilunar cartilage following trauma in 1911. Operation for removal of the meniscus performed at his home the same year. Except for an occasional slight stiffness there was no complaint for four years. Four months before our examination stiffness, limitation of motion, swelling and a little aching developed gradually. Injection of the aspirated fluid intraperitoneally gave positive results.

Of the negative results more will be said later, but one case is cited here.

CASE 110917, F., male, aged 50. Examination July 22, 1914. Swelling of the right knee was first noted one year before. There was present at the time of our examination, a little stiffness and slight swelling and pain, on extreme flexion. Roentgen-ray showed a mild hypertrophic arthritis. The symptoms persisting in spite of treatment, the patient consulted another surgeon, who made a diagnosis of probable tuberculosis and gave a poor prognosis. Four negative tests of the fluid corroborated our diagnosis of a non-tuberculous condition. The subsequent course has further substantiated this conclusion.

#### ABSCESS GROUP.

This group may be reviewed in a very few words. The clinical findings are usually sufficient to differentiate a tuberculous abscess from one

due to mixed infection. There are twenty-three patients in this group. Negative results were reported in many cases that were clinically clearly tuberculous—undoubtedly repeated injections with non-antiformanized material would have resulted in positive tests. We had in all, five positive tests, none of which had sufficient bearing on the diagnosis nor were of sufficient interest to cause us to dwell longer on this group.

#### THE ANKLE JOINT.

In this group there were seven patients. Three gave negative results; clinically they seemed to be tuberculous. In two of these the material was obtained by curettage of the ankle and digested with antiformin. Only one test was made in the remaining negative case, the patient having great destruction of the joint, necessitating amputation. The remaining four patients gave positive returns. In one of these the test was made with material obtained from an astragalus, which was removed; in three fluid was aspirated from the ankle joint and injected. Three of the positive histories are here reported.

CASE 78255, F. G., male, aged 54. Examination January 8, 1913. Six months before a box had dropped on this man's left foot, causing intense pain for a few moments. There was no immediate disability, but one month later pain, rather general in character, began in the foot. He became lame and disability gradually increased, necessitating crutches. There was a small localized fluctuating mass on the outer side of the foot in the region of the ankle joint. Roentgen-ray showed merely marked osteoporosis of the bones of the foot and ankle. The fluid was aspirated and injected intraperitoneally, giving a positive result.

CASE 144659, J. C., male, aged 21½ years. Examination October 30, 1915. Seven months before the child began to limp and complained of pain in his right ankle. Roentgen-ray showed a destructive process in the right astragalus. Fluctuation was present over the front of the ankle joint. Aspiration of the joint furnished fluid for inoculation, and a positive report was returned.

CASE 146444, A. A., male, aged 43. Examination November 24, 1915. For four months pain and swelling had gradually increased in the left ankle and foot. Lateral strain on the ankle caused severe pain. The roentgenogram showed destructive arthritis. Fluid was aspirated from the ankle and subjected to the test, giving a positive result.

The elbow joint, wrist joint and fingers make up a group of nine cases. With the exception of a patient presenting himself with a tumor on the

finger, the results were of no particular significance, the positive test in three cases being merely corroboratory. The history of the patient with the nodule on the finger was interesting.

CASE 82427, male, aged 39. Examination April 4, 1913. For 10 years there had been present a small movable nodule on the outer aspect of the proximal phalangeal joint of the forefinger. No change had taken place in this for 9 years, but during the last year it had increased in size, with accompanying tenderness. The diagnosis rested between malignancy and tuberculosis. The presence of pus suggested tuberculosis, but this might easily have been accounted for by the fact that just previous to our examination the swelling had been twice lanced. Microscopic examination of the tissue removed showed merely inflammatory changes. An emulsion of some of the tissue injected intraperitoneally caused tuberculosis.

The balance, twenty-four in all, were patients suffering from tuberculous shoulders, suspected hip disease, osteomyelitis, periostitis, etc.,—five of these gave positive tests. We cannot here profitably discuss them. They will be included in the general discussion of the series.

#### DISCUSSION.

These tests were made in the bacteriologic laboratory of the Mayo Clinic by Dr. H. A. Sanford. He has kindly furnished me the following regarding the actual technic:

*Technic of animal inoculation.* "In all of this work we have followed only the old and well-known methods described in all text-books. It may be of interest, nevertheless, to describe briefly the procedures necessary for diagnosis of tuberculous infections by means of animal inoculation. No elaborate equipment is necessary, and anyone who has a place to keep a few animals can successfully carry out these tests.

"We have injected clear, straw-colored joint fluids, purulent exudates and discharges, and emulsified tissue. This last has consisted of cartilage, necrotic bone, etc. At one time we would mince the tissue with sterile scissors, and digest with dilute 'antiformin.' We found, however, with bone especially, that 24 or 48 hours were necessary for complete digestion, and as our results were all negative, we were led to believe that in some instances, at least, the virulence of the tubercle bacilli had been destroyed by this prolonged treatment. Accordingly, we now employ entirely the older and more simple method of grinding the minced tissue in a sterile mortar, making an emulsion with sterile physiologic salt solution.

"We make all inoculations intraperitoneally, injecting three to five c.c. of fluid or emulsion. In this again, we have found in a large series, that the old method has many advantages over some of the later 'short-cut' methods. We have tried injecting directly into the liver and also into the groin, traumatizing the inguinal glands, but feel that the advantage gained in the few instances of early diagnoses is outweighed by the uncertainty caused by the doubtful and negative results.

"The animals that we use are usually guinea-pigs. But the orthopedic surgeon must also remember that in young people, especially, infection may be with the bovine type of tubercle bacillus, and to this the guinea-pig is somewhat resistant. The rabbit, however, is very susceptible to bovine strains and resistant to the human type of organism. In some instances then both rabbits and guinea-pigs should be injected.

"Each animal is tagged in the ear with a metal tag bearing a serial number, weighed, and a record made of his color markings from head to hind feet. It is then isolated in a small metal cage. Observations at frequent intervals reveal evidence of disease or loss in weight. Death occurs in from three to ten weeks. If it does not die it is killed in eight to twelve weeks and an autopsy performed. The pathologic findings are striking. The spleen is nearly always greatly enlarged and studded with tubercles. The liver also is often the seat of disease, and at times the parietal peritoneum is dotted with miliary lesions. By cutting into the spleen and spreading the material from a tubercle on a glass slide, the acid-fast bacilli can be demonstrated by the ordinary carbolfuchsin stain."

The confidence we may place on any given test depends upon its accuracy. It is known that although the guinea-pig is the laboratory animal most susceptible to tuberculosis, it very seldom, if ever, develops tuberculosis unless directly inoculated. It is held that if the material to be tested contains the tubercle bacilli, and this material is injected intraperitoneally that the guinea-pig will develop peritoneal tuberculosis. A negative test merely means that the injected material was not tuberculous.

In certain localities many of the cases of tuberculosis in children are said to be of bovine type. Fraser<sup>3</sup> reports that close to 70% of tuberculosis, as encountered in the Children's Hospital of Edinburgh, is due to the bovine tubercle bacilli, and for this blames the poor milk supply. If it is true that in Edinburgh the percentage of infection with the bovine tubercle bacilli is so high, it is probable that in this country we also have a high percentage of the bovine type of infection. While the guinea-pig is not immune to the bovine type, still it has not the same

high susceptibility that the rabbit has. For this reason, when the material is obtained from children our tests are now being checked by rabbit injections. In our clinic, however, the tuberculous patients are largely adults, and the necessity for the rabbit injections not so frequent as it would be in children's hospitals.

Of this series of 143 patients, negative results were reported in 103. Many of those giving negative results were undoubtedly suffering from tuberculosis. Probably if we had repeated our tests with non-antiforminized material, many would ultimately have given positive results. In some it was impossible to obtain more material, and in others it was not considered necessary as the diagnosis was plain or the line of treatment so clearly defined. The use of antiformin to rid the fluid or tissue of mixed infection was responsible for many negative results. Until we discontinued this and merely made a saline suspension for injection our results did not check up with our clinical and pathologic diagnosis. The associated bacterial infections are rarely virulent enough to kill the guinea-pig. To place a definite value on a negative test is a little difficult. We feel that in a condition which is at all doubtful we must have at least three negative tests. As long as there is any doubt about the disease being tuberculous, when practicable, as in superficial joints, fluid should be withdrawn and tested at intervals. The value of negative tests increases with their number.

The test has enabled us to make positive diagnoses of suspected cases and to corroborate our diagnoses in operated cases of doubtful etiology. In many instances it is hard for patients to believe that the comparatively mild symptoms they have at the time of consultation are due to tuberculosis. A positive test is convincing evidence. The patient realizes the seriousness of his disease and aids the surgeon by his acquiescence to protracted treatment and to rigid supervision of his mode of living.

#### CONCLUSIONS.

1. As a test the intraperitoneal inoculation is practicable and requires no special laboratory facilities. The test has been of great value to us in doubtful cases, and in instances in which it is possible to obtain the material for inoculation, has become a routine procedure.
2. A positive bacteriologic test in obscure lesions makes the diagnosis certain.
3. The value of negative tests increases with their number.
4. Antiformin digestion of tissue acts on the tubercle bacilli either to kill them or reduce their virulence so that the low resistance of the



guinea pig will be sufficient to overcome them. It greatly reduces the value of the test and should not be used.

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## A CRITIQUE OF PRESENT METHODS IN THE TREATMENT OF INFANTILE PARALYSIS.

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FOR the purpose of this discussion I will assume that there are five agencies of principal value in the treatment of infantile paralysis. Moreover, these are of maximum value only when used in a certain order and with a definite relationship to each other and to certain stages of the disease.

In the order of their importance in contributing to recovery for any patient who has had infantile paralysis, these agents are: time, splints, exercise, surgery and braces. To this audience it is unnecessary to go into details or to enumerate the subdivisions of these or other expedients which have been suggested for the treatment of these patients.

Neither is it necessary, but I will remind you that many muscles entirely functionless immediately after the acute attack resume practically normal function before any therapeutic measures are inaugurated. We all understand the reason for this, which is that certain motor cells in the anterior horns of the spinal cord have been only temporarily dam-

aged by the inflammatory process, and resume function either wholly or in part before the muscles dependent upon them have materially suffered by the temporarily suspended innervation.

If this innervation is suspended, however, for a length of time which permits profound muscle changes to occur (and this may be only a matter of days, or a few weeks) we have then to deal with a problem of so-called residual paralysis.

If it becomes apparent, either at once or later, that the balance between any two opposing muscles, or sets of muscles, is much impaired, or entirely destroyed, we must then resort to splints. Splints in one form or another must be applied as soon as there is the slightest danger of relaxation, or over-stretching of paralyzed muscles. This particularly applies to the situation when patients with paralyzed muscles or muscle groups show a disposition early to have their extremities assume bad positions. This is true of these patients, whether they are lying in bed, sitting, or undertaking to get about.

Patients protected by splints may have their extremities massaged, stimulated by electricity, or make voluntary efforts, any one of which tends to satisfy my third requirement of exercise.

Splints are absolutely necessary as a preliminary to and associated with any of these treatments. Any such treatment without the use of splints may be not only inadequate but harmful, because such a patient is led to believe that he is being treated, whereas he is being only partially treated. I desire to emphasize that this is not the stage for the application of braces, nor, in my estimation, should braces ever be applied at this stage, except for some exceptional reason. I will introduce my argument on this point a little later.

After from one to two years of time, splints, and exercise, it may be assumed that all of the recovery reasonable to expect, has taken place in the damaged nerve centers. The final effects on muscles and muscle groups may now be determined with accuracy, and recourse may be had to surgery. This may be for the transfer of power from strong muscles to weaker ones, the arthrodesis of paralytic joints, or for such other improvement of function as may be brought about by the varied surgical procedures at our command.

It should be emphasized in all our teaching regarding this disease that surgery should seldom, or never, be necessary for the correction of gross contracture deformity, because by proper splinting, such deformities may almost always be prevented.

In my estimation, the rôle of surgery may best be illustrated by quoting the Whitman operation for paralytic talipes—calcanéo-cavus—as an

ideal orthopedic surgical procedure. The operation is recommended for performance at a time when the maximum of so-called spontaneous recovery has been secured, and when, in spite of further splinting and exercise, greater weakness and deformity would occur. This procedure corrects the deformity, further relaxes the paralyzed muscles, and by transferring the tendons of the peronei, contributes strength to the weakened calf muscle. Further, by removal of the articular surfaces of the opposed bones after astragalectomy, stability is restored to the paralyzed ankle joint. Finally, by the application of the brace following the surgical procedure, the extremity is protected as long as necessary, and the brace is laid aside with a previously badly paralyzed and weakened extremity restored to almost normal function.

This brings me to a discussion of what constitutes the rôle of braces in the treatment of infantile paralysis. Everyone will admit that braces simply as braces have been used too frequently and too unintelligently in the treatment of these conditions. It is a question whether orthopedists and members of this association have not been partially responsible for the widespread and injudicious use of mechanical appliances in the treatment of infantile paralysis.

I am disposed to urge that we should never prescribe braces for our patients until the maximum of improvement has been obtained by time, splints, exercises and surgical operation. Braces applied to a patient at any time sooner than this give him the impression that he is dismissed by his physician, and may look for further treatment wherever he likes. The patient with braces applied too soon is likely to have the impression that without further consultation with his professional adviser, he may have his braces duplicated indefinitely, or even modified to suit his own ideas. Almost any brace-maker will coöperate with and encourage such a patient and lead him to believe that in this way he can continue his treatment at much less expense.

If I may be pardoned for the suggestion, it has at times occurred to me that we have all been too prone to prescribe braces during the splint-stage of treatment. Braces, it is true, will serve as splints, but they do not by any means convey the same impression to the patient.

Moreover, there is nothing that can be done with any brace in the splint stage but that can be done better with plaster-of-Paris. Plaster-of-Paris splints, if properly applied, are not only ideal from the standpoint of efficiency, but, with occasional changes, they convey to patients the idea of continued treatment. They give better control of the affected extremity and of the patient, until such time as surgery and braces may be invoked to meet the final indications in any given case. The brace-

wearing patient, however, who comes late to the orthopedist for surgery, or for further treatment of any kind, comes almost always with the idea that his professional attendant who prescribes the braces has fallen short, or no other procedure would be necessary.

The mechanical side of splinting, as of surgical procedure for these patients, is a problem for the skilled orthopedist and no one else, and it is rarely that any one else undertakes it. The mechanical side of the application of braces, however, while a similar problem, daunts no one, and is frequently undertaken not only by half-qualified brace-makers, but by the patient or the patient's friends, and even through mail-order houses, which deal in everything from pins to threshing machines.

Might it not be well for the members of this Association to go on record, both by precept and example, as opposed to the application of braces except as a final step in the treatment of these conditions, and when they have been improved by the other methods with which we are all familiar, to the maximum amount; not, in other words, until the best results have been obtained which follow spontaneous recovery, combined with those measures by which the patient's resources have been carefully safeguarded? This involves, as I have pointed out, splinting and exercise under the direction of the best orthopedist available for the patient, and for such a length of time as brings him up to the point where he is ready for results obtainable by modern methods of surgery. In other words, let us put the ban upon braces used either as splints, or as aids to locomotion, except for those patients whose disability is definitely established to be permanent, or for whom no other methods of improvement are possible or feasible.

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## CAUSES AND TREATMENT OF PERTHES' DISEASE.

BY FREDERICK C. KIDNER, M.D., DETROIT, MICHIGAN.

THE clinical entity described in 1910 by Legg under the caption, "An Obscure Affection of the Hip Joint," and in 1913 by Perthes as Osteochondritis Deformans Juvenilis, is now clearly recognized by us all. The recent articles by Sunderland, Moller, Wilksee, Michelson, Delitala, Taylor and Allison have all contributed to give us a distinct picture of

the condition, although without furnishing a fully satisfactory name. "Perthes' disease" and "quiet hip disease" (Taylor) are not sufficiently descriptive from a pathological standpoint. The most satisfactory name as yet evolved is that given by Perthes, "osteochondritis deformans juvenilis."

A summary of the various descriptions of the condition may be made somewhat as follows: A previously healthy child, usually after some moderate trauma to the hip, but in many instances without such trauma, begins to limp. He has little or no pain. There are no signs of active infection. The limp varies in amount. Whether treated or not, the limp persists for a varying number of months or years and the condition then gets well, leaving behind a very moderate limitation of the functions of the hip joint. Examination of the patient shows a hip over which there is slight muscle atrophy, and in which abduction and external rotation are much limited. Flexion is practically normal. There is prominence of the greater trochanter. Attempts at extreme motions are somewhat painful. X-rays show early an irregular loss of calcium in the epiphysis, giving it a laminated appearance. This is accompanied by distinct irregular atrophy of the sub-epiphyseal portion of the neck of the femur, which is often so marked as to give the appearance of true cavity formation, single or multiple. The absorption and atrophy go on until the epiphysis of the head becomes merely a few platelets of bone, which flatten together under weight-bearing. At the same time the atrophy of the neck allows it to shorten. As the process goes on to recovery, lime salts are gradually re-deposited in the head which takes on a flattened shape. The neck also thickens and ultimately the appearance is that of the so-called "mushroom hip" of the adult.

All the authors have described the symptoms and signs and course of the disease with great accuracy, but, with three exceptions, they have discussed the pathology of the condition from a theoretical standpoint only. Perthes, in his monograph, described one of his thirteen cases upon which he operated. He opened the hip joint and removed a small piece of cartilage and subjacent tissue from the head of the bone. He found in the tissue removed, an overgrowth of abnormal cartilage extending down into fairly normal bone. From this, in connection with his clinical studies of the cases, he came to the conclusion that the disease is a "*peculiar atrophy*" of the upper epiphysis, brought about by destruction in the subchondral region. Legg, in his original paper, mentions one case in which an operation was performed and a septic focus culled from the neck of the femur. This focus, he believed to be merely a coincidence and in no way responsible for the changes in the head and

neck. Allison has done some experiments on rabbits in which he opened the hip joints and endeavored, by moderate trauma, to produce a condition similar to the osteochondritis of children. These experiments were negative in result.

Up to the present time, therefore, Perthes' single specimen, obtained at operation, is the only pathological material examined. This specimen is of little value as it was taken from the joint surface, a region which the X-rays show to be little affected in osteochondritis. Because of the frequent coincidence of trauma in the disease, Legg came to the conclusion that the atrophic changes in the epiphysis, loss of substance in the sub-epiphyseal region, and the thickening of the neck of the femur were due to an interference in blood supply following traumatism at the epiphyseal line. The other authors, except Perthes, whose opinion is quoted above, and Delitala, have agreed with him. Delitala, from his study of six cases, believes that we must look for the origin of disease in a "congenital alteration, either of the epiphyseal cartilage of the upper end of the femur or of the epiphyseal nucleus which gives way to processes of ossification, which are insufficient and irregular."

There is general agreement that the disease is a self-limited one, requiring only moderate treatment. This ignores the considerable amount of disability caused by the mushroom hip of the adult, a condition undoubtedly the result of early osteochondritis.

The conviction that every effort should be made to avoid the evils of this late deformity, and that more might be learned about the disease through operation, led the author to treat the following case in a more radical manner:

G. A., a previously healthy boy of 5 years, was seen in consultation with Dr. George Hoops, of Detroit, on June 9, 1915. He was the only child of healthy parents. There was no immediate family history of tuberculosis or syphilis. The only illness in the child's history was measles, one year ago. The present illness dates from a fall 8 months before, immediately following which the boy had pain in the left hip without limp, lasting one week. From this he recovered perfectly. In April of this year, without apparent cause, the boy began to limp, and the limp has continued since. For the past three weeks he had complained of slight pain in the left hip. He had had no night cries or sweats, and the family had not noticed fever. His appetite, however, had fallen off and he was not in his usual robust health.

The physical examination shows a fairly developed and nourished boy. Except for the left hip and leg nothing abnormal was found. The muscles of the left hip and buttock were slightly atrophied. There was no permanent flexion or adduction when lying down, but when standing

the thigh was held in 15 degrees flexion and adduction. When lying down adduction was normal, abduction only 5 degrees. Rotation in both directions 15 degrees, flexion to within 20 degrees of normal. Hyperextension absent. All motions in extremes slightly painful and limited apparently by voluntary spasm plus joint change. The left leg was  $\frac{1}{4}$  inch short, the left thigh  $\frac{1}{2}$  inch less in circumference, and the left calf  $\frac{3}{8}$  inch less. The X-ray showed typical irregular loss of bone salts in the femoral head, and a large single sub-epiphyseal cavity with a distinct wall.

The picture, then, except for the slight temperature and doubtful muscle spasm, was typical of an osteochondritis. The slight temperature and evident falling off in general health, together with the X-ray picture, which so closely resembled the "bone abscess" of a low-grade infection, suggested to the author that here might be a low-grade sub-epiphyseal bone infection, which should be treated as such. The patient was accordingly removed to the hospital, where it was found that he ran a temperature from 99 to 100 degrees. His blood count was about 9000, with a very slight excess of polymorphonuclear neutrophils. Unfortunately the exact figures are lost.

Operation was consented to by the parents on the basis that it could do little harm, and probably offered the child a better opportunity for an ultimately good hip than did conservatism.

Operation was performed on June 11, under ether.

A vertical incision was made over and down to the greater trochanter on the outer side. The periosteum was pushed back in both directions, and with a motor drill, using the stereoscopic X-rays as a guide, the cavity just beneath the epiphyseal line was entered. Exploration showed this to be a well walled-off affair, from which was curetted a soft grayish-red material, suggesting broken down cancellous bone. This material was sent to the laboratory for examination, and showed a staphylococcus aureus of low vitality. The cavity was carefully cleaned out, and bleeding stopped with gauze. It and the drill hole were then filled with salicylic acid bone wax, and the wound closed tight with cat-gut and silkworm gut. The leg was then put in a short plaster spica.

The operative recovery was entirely uneventful. The patient was kept off his feet for 3 months and wore a plaster spica for 5 months. X-rays taken in November show that the cavity and drill hole are filling with bone, that the calcium in the epiphysis is more clearly marked, and that the deformity of the epiphysis is not progressing. There is no measurable shortening of the leg. Motions are practically normal. No pain or spasm.

Though this is only a single case, the author feels that the findings justify further research along operative lines.

If we accept Legg's theory that the atrophy and destruction of osteo-



Note flattened epiphysis and distinct cavity just beneath epiphyseal line.



Line of drill hole through trochanter and filling in of cavity.

chondritis deformans juvenilis is due to an interference with the circulation, we are confronted with the necessity of explaining this interference. It is difficult to conceive of a traumatism so small as to be of little note to the patient or his family, and yet great enough to disturb the deeply buried and thoroughly protected circulation of the head and neck of the femur. Many reported cases give no history of traumatism. The author feels that a hematogenous infection of low grade attacking the sub-epiphyseal region of the femur would much more easily account for the disturbance of circulation. The resulting loss of bone salts in the epiphysis would be the same as if the interference were due to traumatism. The destruction of bone in the neck resulting from the infection has an analogy in the blind, comparatively innocuous, circumscribed abscess of bone elsewhere. In his discussion of infections in the neck of the femur, in connection with an otherwise typical case of osteochondritis, Legg dismisses the infection as the cause. This he does because of the many well recognized cases of such infection in the neck, which do not cause the picture of osteochondritis as we know it, but appear as simple osteomyelitis. This seems, to the author, insufficient grounds. May not the location and the virulence of the infection be the determining factor? If infection were just beneath the epiphyseal line, it would



be perfectly placed to interfere with the nutrition of the head of the bone. Practically all the X-rays of reported cases show cavities in this situation, as did the author's case. Traumatism may easily be a predisposing cause, which renders this area susceptible to an infection through the blood stream.

It is easy to conceive that such a low-grade infection occurring in a healthy child may be overcome by the resistance of the individual and go on to complete cure spontaneously, after damage to the growth and shape of the epiphysis and neck has been done. If the infection should be sufficiently severe, then a typical osteomyelitis of the neck of the bone would occur.

In any case, if we have to deal with a destructive process of the head and neck of the femur, which we know ultimately leads to deformity, are we justified in treating the condition so lightly? The author is convinced that the disease should be considered as a serious one in order to prevent the occurrence of such cases as the following:

A district nurse, forty years of age, a farmer's daughter, of great strength of muscle and physique, one of a very strong family. At ten years of age she developed a limp; this was marked for many months, but never laid her up, and was only incidentally painful. During her girlhood and young womanhood, her limp was slight and caused little disturbance. As she grew older, however, the limp increased, until, at the present time, if it were not for her great endurance, ambition and stoicism, she would be forced to resort to crutches, or a cane, a large part of the time. Her femur shows a typical mushroom head. So long as she was light and her muscles were flexible and elastic, a comparatively slight deformity and mechanical disturbance of the joint was of little moment. As her muscles lost their elasticity, the mechanical disadvantage under which they work has become relatively very great. The writer feels sure that, if at the time of the original disturbance of the hip, this patient had been treated for a long period by a traction splint, or other apparatus which would have removed weight from the joint, that the reparative processes would have produced a head and neck of the femur, much more nearly approaching the normal than the one which she now has.

In conclusion then, the author wishes to urge,

*First.* That the clinical entity best called osteochondritis deformans juvenilis is really a mild infection of hematogenous origin of the neck of the femur at the epiphyseal line.

*Second.* That the logical treatment to hasten recovery and limit destruction is the clearing out of this focus.



Mushroom head in adult.

*Third.* That mechanical treatment, which precludes weight-bearing, should be faithfully carried out until the normal structure of the tissues of the head and neck of the femur has been completely restored, in order that deformity may be avoided.

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## A CASE OF MULTIPLE CARTILAGINOUS EXOSTOSES.

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THE patient is a married woman of twenty-five years, who sought advice for a "bunch on the back of her neck." It was called to her attention five years previously, and she herself noticed simultaneously a slow development of a small nodule on the hand. The cervical lump seemed to be growing a little more rapidly just before she consulted a doctor, and there were feelings of discomfort in it while she was at work type-writing, with head bent forward. She complained of mild occipital headaches, and there was a small hard lymph node in the left posterior triangle of the neck. After a few weeks of immobilizing treatment in a Thomas collar, the tumor was removed, because a slight increase in its size was observed during this short period.

Physical examination revealed many additional growths which were unknown to the patient; but no other important peculiarity, except skeletal changes characteristic of multiple osteochondromata, was discovered. Wassermann, von Pirquet and complement fixation tests for gonococcal infection, all were negative.

The patient at the time of examination was healthy looking, well developed muscularly and had active nervous reflexes. She is of short stature, being five feet one and a half inches tall, and weighs one hundred and twelve pounds.

X-rays taken at the time of the examination show abnormal bony growths hidden in various parts of the body. The tumor which was excised was situated on the tip of the fifth cervical spinous process, and the third and fourth vertebræ above were affected (Fig. 1). An exostosis the size of a marble is growing from the vertebral border of the right scapula, and there are unusual overgrowths near some of the costo-vertebral articulations (Fig. 5). At the lower end of the spine can be seen extensive proliferations, especially around the right sacro-iliac region. (Fig. 6). Large and small growths exhibiting rounded or rough outlines are recorded in X-rays of pelvis, femori, tibiæ, fibulæ, and around elbows, wrists and hands. Photographs of knees, ankles, wrists and hands are given in Figs. 13 and 14. None of the abnormal growths, as stated before, were known to the patient except the small one on the hand.

The mid-point of the body from head to foot comes  $11\frac{1}{2}$  inches above the symphysis pubis, owing to disturbances in growth of the long bones

of the legs, the latter being shorter than usual. The left wrist shows characteristic irregular relationships between the lower end of the radius and the lower end of the ulna (Fig. 15). The right wrist is normal (Fig. 16), and growths at ankle joints (Figs. 12 and 11) have not produced much pronation of the feet, as sometimes is recorded.

The personal history of the patient is not especially significant. She had scarlet fever, chickenpox, whooping cough and measles during early life, and has had tonsillitis and sore throat each winter for a number of years. Thus it will be seen that she seems to possess rather low resistance although she is well developed muscularly. She has been married two years and has had no children. Menstruation has always been regular, the first period coming at thirteen years. She was a full-term baby herself, of eight pounds weight.

Her parents are both of English descent; were born in, and have lived in Maine. They were twenty-four years old when the patient was born, and both are living and well, each at the age of forty-nine years. The patient has a sister twenty-two years old, who has a firm solid lump in her neck, presumably of a similar nature.

The patient's mother was poorly developed at birth, although tall and strong now. She was said to weigh only three pounds at first, despite the fact she was a full-term infant; and her mother, the patient's grandmother, at this time was forty-three years old. The latter died two years afterward, without recovering her health again. Previously, however, she had had six healthy children who, so far as is known, show no bony peculiarities. Twelve years intervened between the birth of her last child and the other six children. The patient's mother has a bony tumor on her left tibia, but it is impossible to trace the defects back of her generation, therefore it seems plausible that some obscure abnormal variation originated at the time of the mother's birth, associated with the general retardation of her development; and that she has handed this peculiarity on to her two daughters.

No attempt will be made to discuss different theories of origin at length, for none can be proved beyond question. No observations have been made in microscopical sections from the present case that are antagonistic to the idea stated by Ehrenfried<sup>1</sup> regarding the origin of the tumors, namely, that there are clumps or nests of cartilage cells persisting uncalcified, scattered along under the periosteum and near the ends of shafts in the long bones, where they were left in the process of growth in these patients. It is considered that these groups later may, or may not, develop into cartilaginous exostoses or chondromata, according to poorly understood circumstances.



FIGS. 3 AND 4.—Photographs of neck before and after operation.

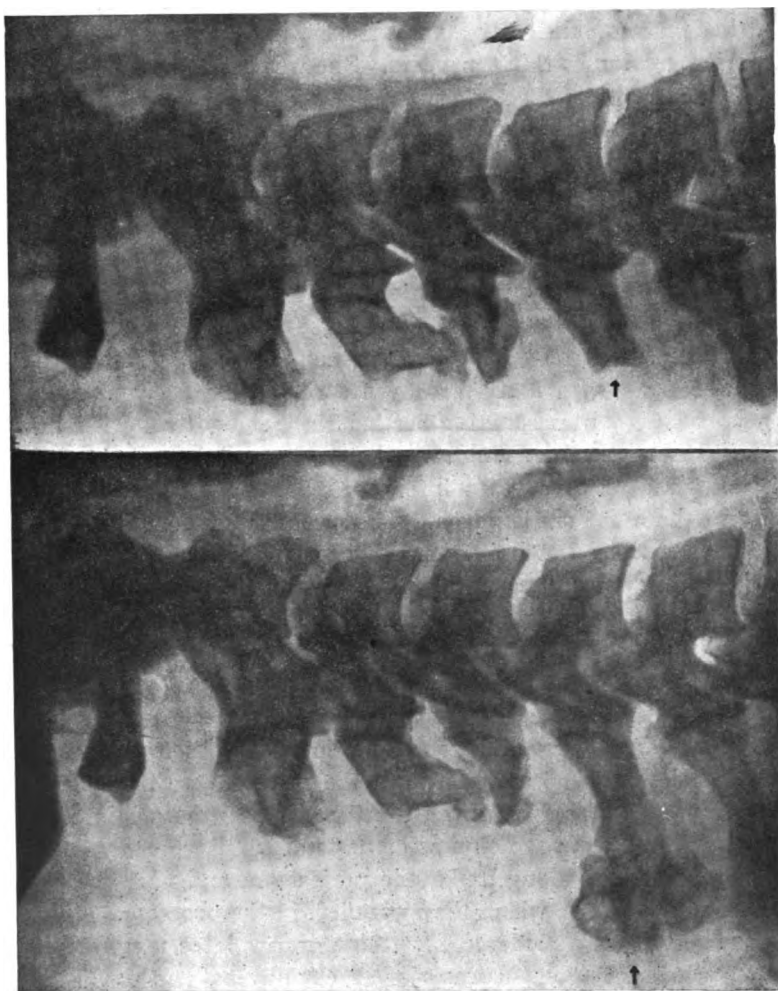


FIG. 1.—Cervical spine with growths on 2d, 3d, 4th and 5th vertebrae.

FIG. 2.—Cervical spine after removal of tumor on 5th vertebra.

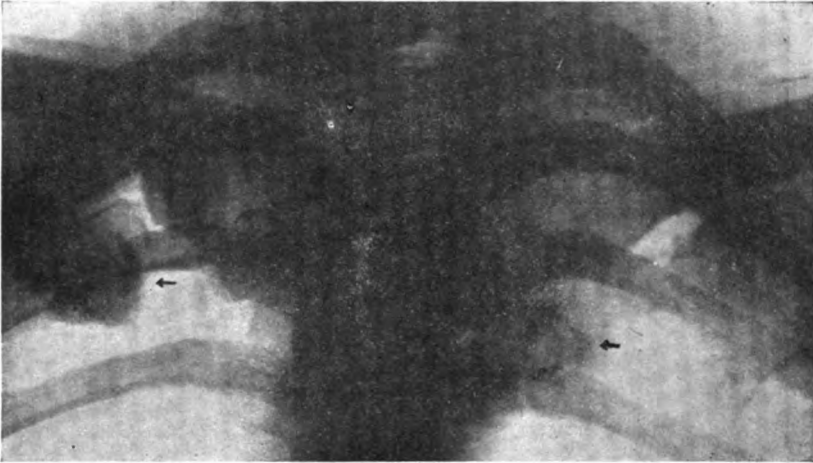


FIG. 5.—Upper dorsal spine with growths on right scapula and costo-vertebral articulations



FIG. 6.—Lumbo-sacral spine with growths around right sacro-iliac joint.



FIG. 7.

FIG. 8.

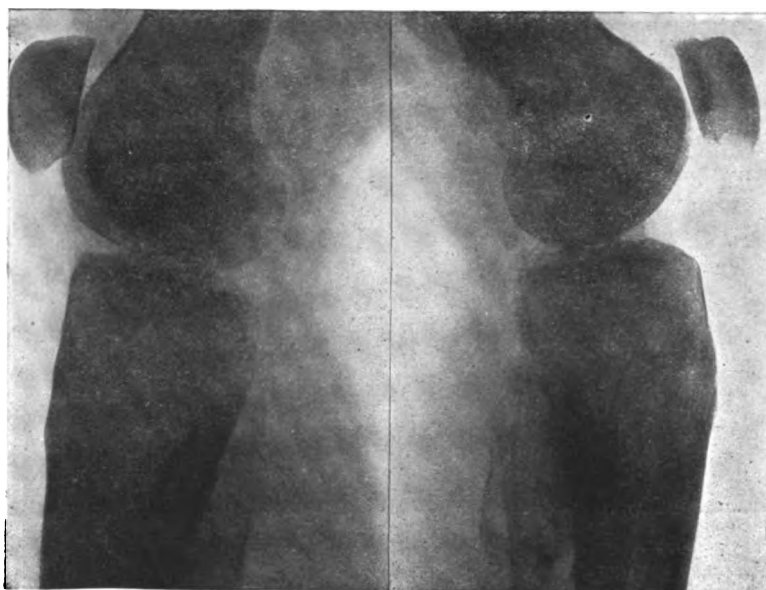
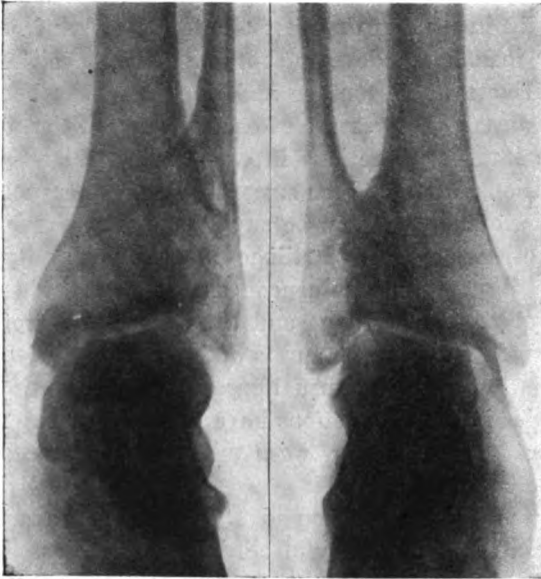


FIG. 9.

FIG. 10.

**FIGS. 7-10.**—Antero-posterior and lateral views of knees, showing extensive growths around insertions of tendons and at tibio-fibular articulations.



**FIGS. 12 AND 11.**—Right and left ankles, respectively, with changes at lower tibio-fibular articulations.

**FIG. 12.**

**FIG. 11.**



**FIG. 13.** — Photograph of knees and ankles, showing very slight pronation of feet.



Perhaps unusual variations in some of the internal glands, either from their over-development or insufficient development, first start proliferations in cartilage cells. Exostoses in mother and daughter thus both may owe their existence indirectly to presence of excessive quantities, or unusual absences, of some internal secretions in circulation, which act upon the bones. Such relationships have been suggested between thyroid glands and multiple bony exostoses. It can be supposed that excessive variations of internal secretions act upon cartilage of average vitality; or that slight variations of secretions influence cartilage of slightly changed resistance; or finally, that cartilage and bone may vary from normal so much themselves, that average amounts of internal secretions alone are capable of stimulating them to unusual growth. Various other circulating substances besides internal secretions have been mentioned as possible causative agents, and associations between tuberculosis and multiple exostoses have been noted.

Theories of trophic nervous origin have been advanced too, and cannot be proved or disproved amid the multiplicity of clinical possibilities. It would be unwise, it seems to the writer, to say that there cannot be more than a single set of circumstances associated with origins. It is just as likely that there are very great inherent weaknesses in original cartilage tissue in some instances, while at other times that vascular peculiarities should be held responsible for developmental failures in the replacement of cartilage by bone. Whether the same vascular variations are concerned in cartilage proliferations as in abnormal persistence of cartilage, has to be considered, and it is conceivable that some nervous factor may occasionally influence growth of the tumors by upsetting the balance maintained between them and their blood supply. We cannot be sure that some physico-chemical peculiarity of the blood is not an important etiological factor, as well as variations in usual chemical vascular constituents. It is idle to speculate on exact causes with our present meagre understanding of the blood, and we can only point to prominent clinical facts associated with onsets of the disease and occurring through its course. The present case helps to confirm its congenital origin and hereditary nature. The importance of mechanical strains and irritations, as additional elements in accelerating growth, are indicated in the present instance by larger sizes of tumors in positions where most frequent strains or continual rubbings occur. Perhaps it may be found in the future that there are similar nests of cartilage cells occasionally under the periosteum in shafts of long bones of these patients; and that these do not develop because there is less irritation or less strain where there are no tendon and ligament attachments.



FIG. 14.—Hands, showing slight ulnar deflection at left wrist.



FIG. 15.—Left wrist showing irregularity at lower ulnar-radial articulation.



FIG. 16.—Right hand with growth on first metacarpal bone and normal relations in wrist.



FIG. 17.

FIG. 18.

FIGS. 17 AND 18.—Lateral views of wrists with growth on left ulna.

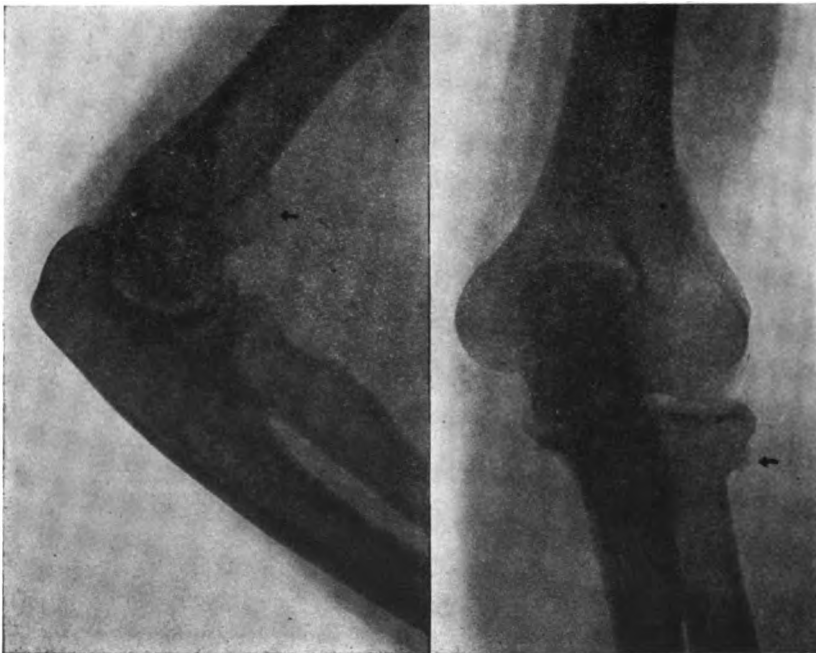
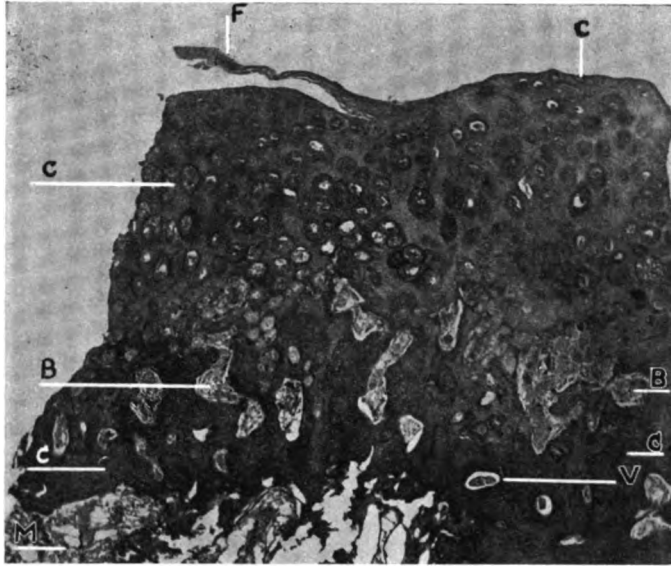
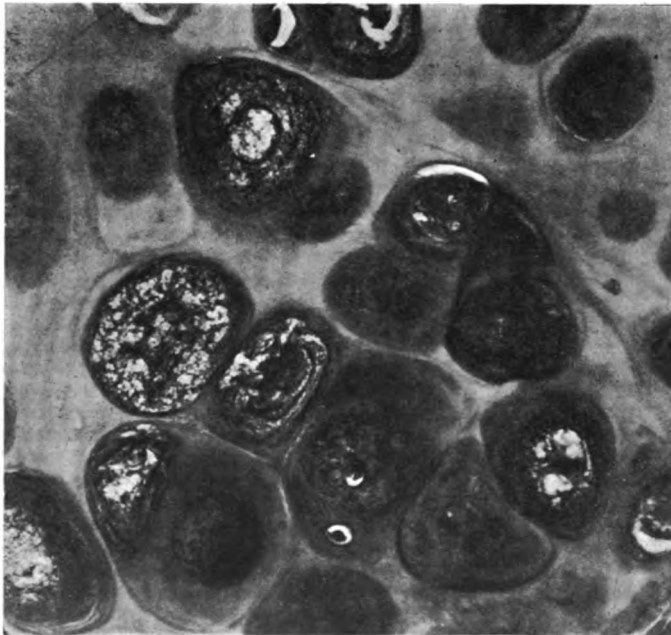


FIG. 19.—Left elbow with growth on humerus.

FIG. 20.—Right elbow with growth on radius.



**FIG. 21.**—Section of cervical tumor showing its free surface and a layer of hyaline cartilage with bony trabeculae and cancellous bone beneath. ( $\times 37$ ) C=hyaline cartilage; B=bony trabeculae; F=fibrous periosteal tissue; V=blood vessel. M=Marrow partially destroyed by preparation of section.



**FIG. 22.**—Hyaline cartilage cells more highly magnified ( $\times 300$ ). The cells are somewhat shrunken, and, owing to the thickness of the section they are cut across through their centers in some instances, while in other cases only small segments of cells without nuclei remain.



FIG. 23.—Pelvis and hip joints, showing growths along crests of ilia, around symphysis pubis, lesser trochanter and neck of right femur and at sacro-iliac region.

The operation performed was a simple one of excising the tumor through a vertical median incision in the back of the neck, separating the posterior muscles and ligaments, exposing the tumor, and cutting it off with an osteotome. It was enclosed in a firm fibrous capsule, which was not adherent to the tumor except where ligaments were attached to the spinous process. The wound was closed with silk sutures, and a Thomas collar helped to immobilize the neck for a few weeks afterwards.

The tumor was the size of a marble and was pale and glistening on its surface. The surface was rather uneven and slightly lobulated, but nowhere were there any evidences macroscopically of cartilage infiltrating the adjoining fibrous covering. The tumor could be cut with difficulty with a stout knife, and the interior was filled with bone marrow enclosed in an outer shell of hard bone. Microscopic sections were made, which show structures somewhat shrunken and torn in preparation, yet, nevertheless, give an idea of the irregular arrangement of hyaline cartilage and bony trabeculae making up the outer shell of the tumor mass.

The thickest layer of hyaline cartilage found in the specimens is seen in the section shown in Fig. 21. In other places it becomes thinned out, even to total disappearance on the surface, being replaced by periosteal tissue. The comparatively thin layer of hyaline cartilage cannot account for the clinical observation of a perceptible increase in size of the tumor. Probably the latter observation would be explained by swelling in the soft parts over the tumor, from interferences in circulation due to the Thomas collar.

Bony trabeculae are very few in the illustration, as compared with many other parts of the mass in which they predominate. The darker appearance of the cartilage in its deepest layers is due to difference in staining, various areas taking the hæmatoxylin and eosin stains quite unevenly. The loose structure of the interior of the mass is indicated at M.

Diagnosis from data at hand should be non-malignant osteochondroma; but it will be interesting to watch in the future for recurrences in the stump of the spinous process (Fig. 2), because a small percentage of tumors are described as losing their benign natures.

There is still slight limitation of motion in the patient's neck, temporarily following operation, and she cannot yet bend forward quite as far as previously. Figs. 3 and 4 show the appearance before and after surgical treatment. She states after operation that her headaches have entirely disappeared, and that she imagines the original local pains were more severe than she realized at the time because she feels so much better now. Some doubts, however, should be entertained as to the actual relief

from pain afforded by the operation. It is true that the patient says former feelings of discomfort in the excised tumor were quite severe at times; but now she imagines similar feelings in the palpable tumor at the knee, which she did not know about previously. Subsidence of headaches can be attributed to rest equally well, and to the decided general improvement in health which has taken place. As there was no tenderness over the cervical mass, and motions of the neck were not limited by it, the writer is inclined to interpret feelings of discomfort complained of in the past mostly as local muscle fatigue or strain, accentuated by the patient's attention being directed to the region.

The dangers of childbirth from exostoses protruding into the birth canal were explained to the patient and an X-ray of the entire pelvis was taken as shown in Fig. 23. No large masses are seen below the pelvic brim, but the symphysis pubis is involved in the process and extensive proliferations can be made out upon the dorsal side of the sacrum around the right sacro-iliac joint. Incidentally this picture shows growths around the lesser trochanter and neck of the right femur. Possibly the abnormal growths present may influence ligamentous relaxations of pelvic joints during pregnancy.

#### SUMMARY.

This is a report of a typical case of multiple osteochondromata with photographs of neck, wrists, hands, knees, ankles and feet. X-rays are given which demonstrate abnormal growths in cervical, dorsal and lumbo-sacral regions of the spine, on the right scapula and both iliac bones, femori, tibiae, fibulae, left humerus, right radius, left ulna and first metacarpal bone of the right hand. Excision of a small tumor on the fifth cervical vertebra was followed by relief from slight aches previously complained of locally in the neck and head. Microscopic appearances of the excised mass are given, indicating its benign character, and showing an irregular grouping of hyaline cartilage and bony trabeculae surrounding bone marrow.

The history tends to confirm the importance of congenital developmental defects as causes and their transmission from mother to offspring; also locations and sizes of abnormal growths indicate that continuous mechanical strains or repeated mechanical irritations may accelerate tumor growth.

Multiple cartilaginous exostoses have been discussed recently by Ehrenfried<sup>1</sup> and Ashhurst<sup>2</sup> and their papers should be referred to for further details and for bibliography of the subject.

In conclusion, the writer wishes to acknowledge his indebtedness to Dr. E. G. Brackett of the Orthopedic Department of the Massachusetts General Hospital for the privilege of reporting this case.

## REFERENCES.

<sup>1</sup> Multiple Cartilaginous Exostoses (Hereditary Deforming Chondrodysplasia): A Brief Report of a Little Known Disease. Albert Ehrenfried, Boston. Journ. A. M. A., May 15, 1915, pp. 1642-46.

<sup>2</sup> Multiple Cartilaginous Exostoses (Hereditary Deforming Chondrodysplasia). Astley Paston Cooper Ashhurst, Philadelphia. Annals of Surgery, February, 1916, pp. 167-175.

## Orthopedic Society Meetings

### AMERICAN ORTHOPEDIC ASSOCIATION.

THE 30th annual meeting of the American Orthopedic Association was held in Washington, D. C., May 8-11, in conjunction with the Congress of Physicians and Surgeons. This brings together from all parts of the United States and Canada a large body of men interested in their profession, and the social factor and interests are fully as important as the scientific discussions.

It has become the custom to devote the day preceding the stated meetings to clinical demonstrations. This year the committee in charge of the clinical day invited certain members of the association to operate on certain types of orthopedic cases in which they were especially interested. They were able to collect suitable cases for operation in all instances which they had previously planned, except one. The program of the clinical day is given below.

## Operations by:

Dr. Fred H. Albee, Bone Transplant.

Dr. W. S. Baer, Arthroplasty.

Dr. John Dunlop, Orthopedic Patients.

Dr. W. G. Erving, Orthopedic Patients.

Dr. W. E. Galle, Tendon Implantation.

Dr. W. W. Plummer, Intra-articular Silk Ligaments.

Dr. J. W. Sever, Obstetrical Paralysis.

Dr. A. R. Shands, Orthopedic Patients.

Dr. R. Soutter, Transfer of Thigh Flexor Attachments to Pelvis.

Dr. Royal Whitman, Astragalectomy, with backward displacement of the foot (the Whitman operation).

There were held during the meeting two symposiums,—the first on the surgical treatment of infantile paralysis, and the second on visceroptosis and its relation to orthopedic surgery. It is now planned to devote the July number of the JOURNAL to the symposium on Infantile Paralysis and the September number to Visceroptosis. There will also be presented the complete discussion of these papers, which are of extreme value, because they were so planned that they represent the consensus of opinion from various clinics and different portions of the country.

Attention is called to Sever's paper on Obstetrical Paralysis, which will be published within a short time. This paper represents the work of several



years, and the large number of cases from which he has drawn his deductions demands attention. It has brought out the fact that obstetrical paralysis, which has always been considered under the division of nerve diseases, should be distinctly an orthopedic problem as regards treatment, and that results should be definitely better than they have been.

### NEW YORK ACADEMY OF MEDICINE.

SECTION ON ORTHOPEDIC SURGERY, MAY 19, 1916.

#### Presentation of Cases:

- a. Syphilitic Lesion of the Clavicle. Percy Willard Roberts, M.D.
  - b. Metaplastic Osteomalacia. George Barrie, M.D.
  - c. Osteo-sarcoma of the Upper End of Fibula. Charles Ogilvy, M.D.
  - d. 1. Staphylococemia with Spinal Involvement.  
2. Multiple Bone Lesions Accompanying an Obscure Constitutional Condition. P. William Nathan, M.D.
  - e. Dystonia Musculorum Deformans. Edgar Oppenheimer, M.D.
  - f. Partial Absorption of Dorsal Vertebrae from Aneurysm of Aorta. William Frieder, M.D.
  - g. Unusual Laxity of the Knee Joint Following Long Hip Extension Treatment. Charles H. Jaeger, M.D.
  - h. Arthropathy of the Ankle in a Diabetic; Infection; Ankylosis. Sigmund Epstein, M.D.
- PERCY WILLARD ROBERTS, M.D., *Chairman*. WILLIAM FRIEDER, M.D., *Secretary*.

### AMERICAN MEDICAL ASSOCIATION.

SECTION ON ORTHOPEDIC SURGERY, DETROIT, MICH., JUNE 13-15, 1916.

#### OFFICERS OF SECTION.

Chairman—Russell A. Hibbs, New York.  
 Vice Chairman—E. W. Ryerson, Chicago.  
 Secretary, Emil S. Geist, Minneapolis.  
 Executive Committee—Newton M. Shaffer, New York; Leonard W. Ely, San Francisco; Nathaniel Allison, St. Louis.

TUESDAY, JUNE 13—9 A.M.

1. Chairman's Address: The Problem of the Chronic Cripple. Russell A. Hibbs, New York.
2. Osteoclasia and Osteotomy. Wallace Blanchard, Chicago. Discussion to be opened by J. Torrance Rugh, Philadelphia, and Herbert P. H. Galloway, Winnipeg, Man.
3. Calcified Hematoma: A Study of the Pathology. Frederick C. Kidner, Detroit. Discussion to be opened by D. B. Phemister, Chicago.
4. The Treatment of Infantile Paralysis. Robert W. Lovett, Boston. Discussion to be opened by E. W. Ryerson, Chicago.
5. Astragalectomy (Whitman's Operation) in Infantile Paralysis. William R. MacAusland, Boston. Discussion to be opened by Charlton Wallace, New York, and Frederick C. Kidner, Detroit.
6. The Prognosis in Infantile Paralysis. Walter G. Stern, Cleveland. Discussion to be opened by Arthur Steindler, Iowa City, Iowa.

## WEDNESDAY, JUNE 14—9 A.M.

7. Localized Osteospondylitis. Willis C. Campbell, Memphis, Tenn. Discussion to be opened by Robert Soutter, Boston, and Frederick J. Gaenslen, Milwaukee, Wis.
8. Syphilitic Bone and Joint Lesions Simulating Tuberculosis. Arthur L. Fisher, San Francisco. Discussion to be opened by Henry W. Frauenthal, New York, and James T. Watkins, San Francisco.
9. A Statistical Study of the Hospital and Educational Needs of Cripples in the United States. H. Winnett Orr, Lincoln, Neb.
10. Results of Research on Conditions Affecting Posture. Henry Ling Taylor, New York. Discussion to be opened by J. E. Goldthwait, Boston.
11. Mechanical Derangements of the Knee Joint. Melvin S. Henderson, Rochester, Minn. Discussion to be opened by John L. Porter, Chicago, and Willis C. Campbell, Memphis, Tenn.
12. A Plea for the Prevention of Deformities Following Burns. Charles A. Parker, Chicago. Discussion to be opened by John P. Lord, Omaha.

## WEDNESDAY, JUNE 14—2 P.M.

13. Sciatica: An Analysis of Fifty Cases. Mark H. Rogers, Boston. Discussion to be opened by Leonard W. Ely, San Francisco.
14. Fat Embolism in Bone Surgery: Incidence and Control. E. W. Ryerson, Chicago. Discussion to be opened by William E. Blodgett, Detroit.
15. Orthopedic Surgery in War Time. Robert B. Osgood, Boston. Discussion to be opened by Nathaniel Allison, St. Louis.
16. The End-Results of Joint Tuberculosis from the Records of the New York Orthopedic Dispensary and Hospital. Robert E. Humphries and Herbert A. Durham, New York. Discussion to be opened by John Ridlon, Chicago.
17. The Evolution of Osteochondritis Deformans Coxae Juvenilis. Albert H. Freiberg, Cincinnati. Discussion to be opened by J. R. Kuth, Duluth, Minn.
18. Hereditary Deforming Chondrodysplasia—Multiple Cartilaginous Exostoses. Albert Ehrenfried, Boston. Discussion to be opened by Thomas R. Boggs, Baltimore, and R. T. Vaughan, Chicago.

## THURSDAY, JUNE 15—9 A.M.

## Election of Officers.

19. Compression Paralysis of Pott's Disease in Adults. Charles M. Jacobs, Chicago. Discussion to be opened by Clarence B. Francisco, Kansas City, Mo.
20. Ankylosing Operations on the Spine. Leonard W. Ely, San Francisco. Discussion to be opened by Fred H. Albee, New York.
21. The Operative Treatment of Tuberculosis of the Spine. Nathaniel Allison and Herbert H. Hagan, St. Louis. Discussion to be opened by John L. Porter, Chicago.

22. A Report of Two Cases of Scoliosis with Pressure Paraplegia. John Ridlon, Chicago. Discussion to be opened by Arthur J. Gillette, St. Paul.
  23. New Methods of Precision in the Treatment of Fractures. George W. Hawley, Bridgeport, Conn. Discussion to be opened by Fred H. Albee, New York.
  24. The Treatment of Some Fractures of the Femur. Frank E. Peckham, Providence, R. I. Discussion to be opened by F. J. Cotton, Boston.
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### MEMORIAL TO DR. B. E. MCKENZIE.

APPARENTLY in his usual vigorous health and actively pursuing the duties of his profession until a few days before his death, DR. B. E. MCKENZIE, of Toronto, passed away on April 21st, at the age of 65 years, following an operation to relieve symptoms of intestinal obstruction. The condition found at the time of operation seemed to show that very extensive adhesions, resulting from a severe attack of appendicitis which he had suffered three or four years ago, and for which drainage was required, had caused the obstruction referred to.

Those of his personal friends who had the privilege of knowing Dr. McKenzie intimately could not but experience deep grief and a profound sense of personal loss when the news of his untimely and unexpected death came to them. The writer was perhaps more closely acquainted with the deceased than any other member of the American Orthopedic Association, having been associated with him professionally for nine years (from 1896 to 1905), and the result of these years of daily contact in a professional, social and friendly way, was an ever-deepening respect and admiration for one who possessed in rare measure many of those qualities of mind and heart which universally command esteem. Good heredity and the early environment of his life on the farm furnished him with an excellent physical foundation, and also caused him to enter upon his career established in principles of conduct and a philosophy of life which, if it erred to any extent in the direction of moral strictness, preserved him throughout life from undue selfishness, made him an unconscious and spontaneous observer of the Golden Rule and endowed him with a deep sense of responsibility for making the most of his time and his personal capacities.

After graduating in Arts and in Medicine he spent a number of years as a general practitioner in a country district, thereby gaining that invaluable general medical experience which is the best possible foundation for a career in any of the medical or surgical specialties. After a few years his hunger for a wider knowledge of his profession led him abroad to pursue post-graduate study, and while thus engaged his natural mechanical ability attracted him so strongly to orthopedic surgery that he resolved to devote himself to this specialty as his life work, much of his inspiration and enthusiasm in this direction being derived from association with Dr. Virgil P. Gibney at the Hospital for Ruptured and Crippled in New York. Returning to Toronto, he became the pioneer

Orthopedic Specialist in Canada, and remained for a number of years the only surgeon in the entire Dominion limiting his practice to orthopedics. At that time—thirty years ago—orthopedic surgery was in a crude and comparatively undeveloped state, and it was Dr. McKenzie who laid in Canada the foundations of that knowledge by which the profession and the public finally came to understand what orthopedic surgery really stands for and to recognize it as one of the most necessary and beneficent of the surgical specialties.

A man of splendid physique and distinguished appearance, Dr. McKenzie could not but attract more than casual attention in any miscellaneous gathering. He had a most logical mind and a faculty of expressing himself without hesitation in exact and forceful English. As a clinical teacher he possessed rare ability in bringing out the important facts in connection with the case under examination in such a way as to impress them indelibly upon the minds of his students. He was always hungry for fresh knowledge in regard to any subject connected with orthopedic surgery, yet in this connection, as with everything else in life, his mind was so keenly analytical and his judgment so independent, that he could accept nothing whatever simply because it bore the passport of authority. The writer never knew a surgeon who possessed such an intuitive and instantaneous perception of mechanical principles; and this faculty, of course, not only helped him to pick out what was meritorious from the mass of material presented by other orthopedists, but enabled him to hew out new paths where none existed before, and he never hesitated to act on the strength of his convictions.

Personally, he was the soul of honor, incapable of knowingly taking advantage of any one, but also recognizing clearly what was just to himself. His heart was kindly, his impulses generous, his disposition cheerful. His marriage early in his professional career to Miss Hattie Beebe proved to be a union of kindred spirits, and those who had the privilege of becoming acquainted with the rare gentleness, the unruffled equanimity and the unfailing womanly common-sense of his life partner, had no difficulty in understanding why he regarded her as the greatest good fortune life had brought to him.

In politics, while his leanings were Liberal, his independent habit of mind saved him from slavish allegiance to any political party. He was a life-long total abstainer, a regular attendant of the Methodist church, and his philosophy of life included a profound and reverent belief in an omniscient and loving Providence.

He was elected to membership in the American Orthopedic Association in 1889, and served as President of this Association in 1905. He made a number of important contributions to the literature of Orthopedic Surgery, and probably many more would have come from his pen had the duties of his professional life been less exacting. The Toronto Orthopedic Hospital, which was founded as a direct result of his labors, will long remain a fitting memorial to one whose name will occupy a place of reverent esteem in many hearts.

HERBERT P. H. GALLOWAY.

## Correspondence

*To the Editor of the AMERICAN JOURNAL OF ORTHOPEDIC SURGERY:*

In reading over an old volume of *Medical Commentaries* which I have recently acquired, I found what I think must be the first reference to plaster-of-Paris as means of fixation. I am asking if you will publish this to see if any of your readers know of an earlier use of this method.

HARRY C. LOW, M.D.

### ACCOUNT OF THE ARABIAN MODE OF CURING FRACTURED LIMBS.

Communicated to Dr. Guthrie of Petersburg, by Mr. Eaton, formerly Consul at Bassora.

Having often seen much mischief occasioned by tight bandages, I am astonished that the able surgeons of Europe have never discovered a better method of reducing fractured limbs than that at present in use; more especially as I observed amongst the Arabs one infinitely superior (in my opinion) in every point of view, and accompanied with every possible advantage and conveniency, whether to the patient or surgeon.

However, to enable others to judge of it, I shall here relate a case, where I attended the reduction of the fracture, and saw the cure completed, although of that desperate kind which would scarce have been attempted in Europe without amputation.

An Arab, one of my soldiers at Benderneck, on the Gulf of Persia, having had his leg and foot fractured, and almost crushed to pieces, by the falling of a field piece from its carriage upon him, which forced the ends of the bones through the skin, our European surgeon proposed immediate amputation above the knee as the only means of saving his life, and prognosticated the death of the patient, from his obstinacy in refusing to submit to the operation. The Orientals in general, particularly the inhabitants of those parts, will never consent to have a limb cut off; so that the people of the country undertook his cure in their own way, which succeeded beyond expectation, and which is the intention of this letter to describe.

#### ARABIAN MODE OF TREATMENT.

After having transported the wounded soldier into an *atican* (or open recess, arched above), and placing him on the floor, his leg lying on an *oiled mat*, they reduced the bones and shattered parts into as good a form as they could, to be inclosed in a case of gypsum of Paris plaster; an operation they perform much in the same way as is practised by statuaries to take a cast of a limb, with some little variation to serve particular purposes in the cure, which is to be effected in a light case of this matter, to keep the parts in proper position, and defend the wounds from insects, air and external injury.

To accomplish this purpose, then, they first poured the Paris plaster under the leg, till it rose to such a height as to touch its whole lower surface and part of the thigh, filling up all inequalities, so as to form a sort of bed for the wounded leg to repose equally upon in all its parts; placing at the same time a few pieces of hollow reed at proper distances, and in such position, as to serve to conduct away through the plaster any fluid that might collect in the gypsum case, from the wounds, etc.

When this plaster cushion was become firm, which it does in a very short time, the whole leg was next covered with the same Paris plaster, so as to inclose it completely, and, on hardening to form a light case or plaster boot, to keep the parts in as natural a position as the shattered state of the leg would admit of, leaving small openings opposite to the projecting pieces of bone to admit of their exfoliation.

They next made a sort of furrow or channel in the soft plaster, on the upper surface, the whole length of the shin-bone, and directly over it, to receive such vulnerary fluids, during the treatment, as they may think conducive to the cure, and which filter through the plaster or gypsum, to humect the leg at pleasure.

Lastly, to render this upper shell or covering more easily removed and changed during the cure, if necessary, to examine the state of the parts, etc., they made deep incisions into the soft plaster, both lengthways and across, though not quite through to the leg; by means of which, the upper case is removed without disarranging the limb, whilst the cushion or plaster bed on which the leg reposes, is seldom either changed or touched during the whole process, although the oiled mat under all prevents the adhesion of the gypsum to the floor, and makes transporting the whole boot or plaster case practicable, should such a measure at any time be found expedient.

By this simple and curious Arabian practice, the soldier was perfectly cured. As to the duration of the treatment, the accident happened in May, and on the Colonel's return from a second expedition in September, he found the patient walking about, and enjoying the use of his leg, in spite of considerable deformity, the natural result of so terrible and complicated a fracture, where both the bones of the leg and foot were broken and splintered in a very uncommon manner, with several sharp pieces of them projecting through the muscles and skin.

The fluid employed was an ardent spirit drawn from dates, a species of arrac made in that country, poured into the trough or furrow over the shin bone from time to time, so as to filter through, and keep the leg always moist, till the wounds were cured.

The writer thinks that an improvement on the Arabian plaster-of-Paris case would be to make it with a movable cover, or upper case, joined at pleasure to the lower, by means of holes in the edges of both, in the manner casts are taken; which would enable the operator to examine the state of the parts when he pleased, without breaking to pieces the cover every time he removed it, as is the practice of the Arabians, although they seldom touch the limb, till it be cured, except to pour on the spirit of dates.

Medical Commentaries for the Year 1794, Collected and published by Andrew Duncan, M.D., F. R. & A. SS., Editor., Volume Tenth. Philadelphia. Printed by Thomas Dobson, at the Stone-House, No. 41 South Second Street.

## Book Reviews

*Back Injuries and Their Significance.* ARCHIBALD MCKENZIE. Edinburgh. F. and S. Livingston. 1916.

This presentation of the rather broad subject of back injuries is largely limited to the medico-legal standpoint, and is written with the object of throwing light upon the difficulties in determining the diagnosis and genuineness of the complaints. It is prefaced with a concise but somewhat elementary review of the anatomy of the spine and the muscles of the back, and of the physiology and pathology of muscles. The main subject is then taken up under the heading of examination, in which history, complaint, different forms of pain, stiffness, weakness, inspection, palpation, movements and measurements, X-ray examination and electrical testing are mentioned. The second part is presented as physics of back injuries and comprises some descriptions of the inherent weakness and strength of the spine, and the dynamics of extrinsic and intrinsic violence. A brief but valuable appendix furnishes a summary of symptoms following various forms of injury, and a description of the reflexes.

The book has much to recommend it as a careful description of the physiology and physics of the normal spine, but it is of less value from a clinical standpoint. In addition to the fact that many statements are made in which well-grounded differences of opinion exist, there is an attempt to present too much general and too little specific information. Likewise, the means of presenting the subject by symptoms rather than by clinical entities is confusing. The book also suffers from omission, nothing being said, for instance, of the influence of previously existing conditions, such as congenital or acquired anomalies or malpositions, faulty posture, disease or trauma, on the later injury.

*Autoplastic Bone Surgery.* DAVISON AND SMITH. Philadelphia: Lea and Febiger. 1916.

This book on bone-graft is the work of two men, one being a pathologist and the other a surgeon. The first three chapters are devoted, very properly, to a résumé of our knowledge of the pathology and physiology of bone. It includes a very good review of the literature; and is a fairly simple exhibition of a difficult subject.

Chapter V gives a good working description of instruments and technique, the use of the electric saw, etc.

The rest of the book is devoted to the use of the bone-graft in special conditions, and includes the two methods for tuberculosis of the spine, fresh fractures, un-united fractures, and several rather special conditions.

*Surgery in War.* ALFRED J. HULL, F.R.C.S. Philadelphia: P. Blakiston's Son and Company. 1916.

This is one of the most readable and interesting books recently published on War Surgery. It contains a good deal that is of interest to the general surgeon, because it takes up very clearly the treatment of gunshot wounds in various parts of the body. The chapters dealing with fractures and joint injuries are of especial interest to the orthopedic specialist, and are very well presented. It is clear that the present war has brought out the need of orthopedic treatment, as is shown in every book that has been recently published.

*The Intervertebral Foramen.* By HAROLD SWANBERG. Chicago Scientific Publishing Company. 1915.

This volume is composed of a series of full-page photomicrographic plates with complete descriptive text. It is an atlas and histologic description of an intervertebral foramen and its adjacent parts.

The first dorsal intervertebral foramen of the cat was selected for making the studies. The series of histologic sections begins inside the spinal canal and continues outward until entirely outside the intervertebral foramen. These sections show the exact relations of the first dorsal nerve at the intervertebral foramen, and a study of them will help to determine whether compression of the nerves at this point is likely to occur; and whether, therefore, there is substantial ground for the doctrine that such compression is the immediate cause of all or of a considerable number of pathologic conditions.

The conclusions reached are these: The spinal nerve within the spinal canal is entirely surrounded by fat, in the foramen it is almost entirely surrounded by fat and is in contact with fibrous connective tissue at two points, while outside the foramen the fibrous connective tissue forms its sheath. The foramen itself is about three times the size of the nerve, and there are no changes which can take place either in the intervertebral discs or the articular cartilage of the facets which can alter this relationship sufficiently to permit the nerve to be pinched by bone.

In dissections of the human body the author has seen many ankylosed specimens where the intervertebral foramina have been greatly reduced in size, but in every instance there seemed room enough for the nerve to pass free from any bony pressure.

The inference from this study, therefore, is that the theory that the spinal nerves may be pinched by the bony walls of the intervertebral foramina is a fallacy.



# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.
- X. War Surgery.

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## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

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CERTAIN ASPECTS OF INFANTILE PARALYSIS, WITH A DESCRIPTION OF A METHOD OF MUSCLE TESTING. R. W. Lovett and E. C. Martin. *Jour. A. M. A.*, March 4, 1916, p. 729.

This paper presents the result of investigation of the cases of infantile paralysis in the Vermont epidemic of 1914, with one hundred or more additional cases from Boston. This study was largely made by means of a muscle testing device, used because it enabled more exact classification of the cases with partial paralysis of certain muscle groups (partial paralysis was nine times as frequent as total), and because it furnished a scale by which to work out a more precise treatment. The test itself consisted of the exertion of the muscle in question against a spring balance held by an assistant at right angles to the long axis of the limb, twenty-two tests for the upper and lower extremities being employed on each side. The results of this test are confirmative rather than new. The danger of over-exercise of paralyzed muscles, the frequency of spontaneous improvement, the distribution of the paralyzed muscle groups, the general stimulation by the treatment of one group, and the superiority of muscle training over massage, were all more exactly demonstrated than by previous methods of testing.—Eben W. Fiske, Boston.

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THE OPERATIVE TREATMENT OF BRACHIAL PLEXUS PARALYSIS. William Sharpe. *Journal A. M. A.*, March 18, 1916, p. 876.

Obstetrical paralysis is caused by prolonged forcible separation of the head from the shoulder, and may involve all the muscles of the arm when all the roots of the brachial plexus are extensively injured, or upper or lower arm types, depending on damage to a portion of the plexus. Dislocation of the shoulder may accompany the paralysis but it is not its cause, being produced separately by the same trauma, or resulting from a paralysis of the external rotators of the shoulder, which permits the unopposed dislocating action of the pectorals. Immobilization and elevation of the shoulder will permit overstretched nerve roots to recover and even small tears to heal, and this should be a routine procedure. While reduction of a simple dislocation will

end an apparent paralysis, paralysis with definite nerve rupture cannot be cured this way, though some cases are slightly improved. Operation at one month of age is attended with little risk, and the early anastomosis gives better union, less fibrous tissue, and very little retraction of the nerve ends. A transverse incision just above the clavicle in the posterior triangle comes down directly on the plexus, which is superficial, avoids important structures and causes little bleeding, this being important to avoid because of the formation of adhesions. After the fibrous tissue is cleared away, nerve suture is simple, with the head approximated to the shoulder. The results of fifty operative cases have been very good, especially in those at three months of age.—*Eben W. Fiske, Boston.*

COMPLICATED NERVE TISSUE INVOLVEMENT ARISING FROM SYPHILIS OF THE VERTEBRÆ. C. C. Wholey. *Journal A. M. A.*, February 26, 1916, p. 627.

That syphilis of the vertebrae may give a widely varying symptomatology from nerve involvement, which may be more suggestive of the condition than any sign arising directly from spondylitis, is shown by the case reported by Wholey. The patient, aged fifty-two, with a generally negative history, showed alarming symptoms from loss of sensation in throat and larynx, and in the bladder, rectum and legs, pointing to cervical and lumbar cord disturbance. There were exaggerated upper extremity reflexes, abolished knee jerks, slight Rhomberg, rigid spine on forward bending, and unequal pupils. The Wassermann was negative, but the spinal fluid showed five and one-half lymphocytes per mm. with heavy globulin precipitate. The X-ray showed osteoarthritis of the cervical and lumbar spines, with distinct lipping of the vertebral borders. This condition gave a clue to diagnosis, as it was felt that the exudative processes incident to the spondylitis had caused compression of the cord and sensory nerve roots. The similarity between the cervical and lumbar lesions and the symmetrical distributions, seem to eliminate tuberculosis and carcinoma, and it was felt that "rheumatoid arthritis" did "not exhibit such sporadic spinal distribution." Anti-syphilitic treatment caused a great change, and the patient is now at work and almost well. The case illustrates the danger of eliminating cerebrospinal syphilis as etiologic in every obscure or indefinite clinical picture.—*Eben W. Fiske, Boston.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

ARTHRITIS DEFORMANS IN THE LIGHT OF A NEW INVESTIGATION. G. Axhausen. *Berlin. klin. Wochens.*, November 22, 1915, p. 1205.

Axhausen finds that the histological picture in arthritis deformans is a complete or partial necrosis of the cartilaginous area. There are islands of necrotic cartilage, surrounded by growing connective tissue. In the beginning cases the cartilage, which macroscopically shows hardly any changes, is bereft of cells, although cells are present in the deeper layers. In certain areas the entire thickness of the cartilage showed no cells and the underlying marrow was replaced by connective tissue. He was able to reproduce this cartilaginous necrosis experimentally by the use of electrolysis. These necrosed areas are often caused by trauma to the joint. Secondary death of cartilage may occur from the irritation of constant rubbing of one part of the joint against another. The article is chiefly controversial, disputing the conclusions reached by von Stubenrauch and Pommer from their studies of the subject.—*Roland Hammond, Providence, R. I.*

SPOROTRICHOSIS OF THE BONES. A CLINICAL AND EXPERIMENTAL STUDY. Guiseppe D'Agata. *Il Policlinico*, xxiii, Sez. chir., 1, 15-I, '16.

In 1912 D'Agata reported a case of primary sporotrichosis of the superior maxilla, the first reported for this bone. In going over the literature he finds fourteen other cases of primary bony sporotrichosis. His case, as well as several of the others, gave no history of trauma. While direct examination of the lesion, combined with the clinical history, made him think of a tubercular or a syphilitic process, microscopic and biologic researches enabled him to make certain that a special hyphomycete was the true infecting agent in the bony lesion. Tubercle bacilli and actinomyces were absent from the pus. Wassermann reaction negative. Growth of sporotrichum *Beurmanni* appeared in seven days at room temperature, on Sabouraud's acid dextrose agar. That this was not merely a saprophyte growing in the mouth was shown by positive agglutination reaction between the patient's blood and the spores of the organism. There was also a lesion in the tibia.

In all these cases the infection entered through the skin by means of infected sticks, splinters, etc., or some trauma favored the attachment and growth of organisms circulating in the blood, the point of entry for these being the mouth, where sporothrix has been found as a living saprophyte, or by the intestine by means of raw or partly cooked vegetables. It is to be noted that most of the patients came in contact with dry vegetables, straw, bark or sticks,—material on which the organism has been found in its saprophytic state.

The bones chiefly affected were, lower third of tibia, distal end of forearm bones, the short bones of the hand, the heel, the frontal, and the sternum.

Referring to the experimental work published by Gougerot, Vaucher, and Marchand, he describes the progress of the lesion beginning in the medulla and extending outward. Sometimes it goes on to abscess and spontaneous fracture, in other cases the process is more sclerotic. Rarely the process begins as a periostitis. These lesions might easily be confused with other granulomata, especially tuberculosis and syphilis. The occupation of the patient, the location of the lesion, the absence of pain, tenderness or glandular involvement, the good general condition are important points in the clinical diagnosis. The concomitant lesions of the skin or mucous membranes also aid the diagnosis.

Examining pus from a lesion, one may find short ovoid cells 2 to 10 microns in length by 1 to 3 in breadth, with finely granular protoplasm, staining more intensely at the ends than in the centre and surrounded by fine colorless membrane. Many polynuclear leucocytes are present. Inoculate tubes of potato or Sabouraud's agar with material from lesion. Growth at room temperature in from four to twelve days shows the peculiar felted appearance of sporothrix cultures. Intraperitoneal inoculations of male mice or rats give characteristic periorchitis in 10 to 20 days.

The spore-agglutination of Widal and Abrami is of great service, especially in those cases where deep lesions do not permit removal of material for culture. Serum from patient in various dilutions from 1/20 to 1/1000 is mixed with homogenous suspension of spores. Result may be read after 30 to 60 minutes, positive agglutination from 1/150 to 1/800. Other mycoses may give cross agglutination but only in dilution of 1/50 to 1/150.

Energetic treatment with iodide of potash, 45 to 60 grains per day, will bring about clinical cure, but treatment should be continued for a long time to prevent a relapse.

The author goes on to describe his own experimental inoculations, and illustrates the changes in the osseous tissue.

His conclusions are: 1. Sporothrix can cause osteomyelitis and osteoperiostitis. 2. Clinical diagnosis is difficult if there are no skin lesions. 3.

Fortunately the laboratory diagnosis is simple. 4. With *Sp. Beurmanni* isolated from his case of osteo-periostitis of the upper maxilla, it was possible to obtain and demonstrate in the bones of experimental animals lesions such as are found in human pathology.—*Calvin G. Page, Boston.*

**RADIUM AND RHEUMATISM.** Samuel Delano. *American Medicine*, June, 1915.

Delano offers the reasonable doubt that an infection causation cannot be imputed to all cases of rheumatism. "No single thing in medicine is more typical than acute follicular tonsillitis without the slightest suspicion of joint symptoms." The chronic focus-of-infection theory does not dispose of the vast number of cases in which no possible source of infection can be discovered. Many hot beds of infection do not produce rheumatism. Whether or not we believe in the infection theory, the removal of a suspected source or sources of infection has been disappointing, utterly failing to dispose of the trouble. Pain, infiltration, congestion, impaired function, may persist after the source of infection is removed, and the task of the physician is to combat these conditions.

Delano finds encouragement in the use of radium, both in acute and chronic rheumatism. Radium emanation has an affinity for the blood, and the active deposit from the emanation lodges chiefly in the bone and bone marrow. Emanation increases the phagocytic power of the white corpuscles, has a mildly bactericidal action, and produces a rapid increase of red cells. The author cites cases illustrating the resorption of inflammatory products with marked relief from pain. The more sub-acute the condition, the greater the prospect of success. The insidious forms of rheumatoid arthritis are hard to influence. The writer is indefinite as to dosage.—*Ellis Jones, Los Angeles.*

#### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

**RETARDED OSSIFICATION AS AN ETIOLOGICAL FACTOR IN TRAUMATIC ARTHRITIS AND EPIPHYSITIS.** John McWm. Berry. *Journal A. M. A.*, March 18, 1916, p. 868.

Berry cites three cases of traumatic arthritis or epiphysitis in which he considers retarded ossification, as seen by the X-ray appearance of the epiphysis, as the chief etiological factor. Two of these cases were of the knee and ankle each, the third an involvement of the heel, in all of which X-rays of the wrist showed a development of ossification equivalent to that of a child of three or four years longer. The wrist was so used, because of Rotch's findings, that it was a fairly accurate guide to ossification. Rotch also suggested that such cases were liable to strain, but did not furnish examples, as in the present article.—*Eben W. Fiske, Boston.*

**TREATMENT OF SUBPERIOSTEAL HEMATOMAS IN RACHITIS.** Peiper. *Deutsche medicin. Wochens.*, February 10, 1916, p. 153. Abstracted in *Jour. A. M. A.*, March 25, 1916, p. 990.

Peiper comments on the liability to blunder in the differentiation of the subperiosteal hematomas of this disease. In one case a ten month's babe became pale, anemic, restless and irritable, the lower third of both femurs tender, and a hemorrhagic swelling was prominent around each of five teeth, with hemorrhages in the conjunctivae and subperiosteal hematomas in the legs, and also in the orbits, causing extreme exophthalmos. The trouble must be quickly recognized and the food changed from sterilized milk or other improper food to unboiled food, or the child may succumb to hemorrhagic

bowel trouble or pneumonia. Stools must be carefully watched, for young infants cannot long stand raw undigested milk. Fruit juices and beef juice with fresh vegetables may be added later. Avoid operation for extravasations. Fractures heal well when held between sandbags in correct position. If a sedative is necessary, 5 c.c. of a two percent. solution of chloral three times a day in the milk may be given. Improvement will begin in eight or nine days, but complete recovery may require weeks or months. If breast milk is available, it should be used until the symptoms subside. Infantile scurvy was known before milk was sterilized, and is more common in the homes of the well-to-do. Bottle babies after the sixth month should always be getting some additional gruel or pap, and by the ninth month a little vegetable, fruit juice and fruit.—*Roland Hammond, Providence, R. I.*

STUDIES ON THE URIC ACID IN THE BLOOD IN GOUT. Joseph H. Pratt. *American Jour. Med. Sciences*, January, 1916.

An interesting study of the uric acid content in the blood of gouty patients under various conditions. Many valuable observations are recorded.—*Arthur J. Davidson, Philadelphia.*

TREATMENT OF RACHITIS. M. Schloss. *Jahrbuch f. Kinderheilkunde*, January, 1916.

A series of eight articles, the publication of which was spread over the course of a year, showing the metabolic findings of eighty rachitic children taking many of the various accepted antirachitic remedies.

The author gives no real summary of his work, despite the extravagant use of the German equivalent for italics, so that the reviewer found it difficult to determine what remedies, if any, the author has found most efficacious in the treatment of rickets, as he only compares one set of metabolism experiments with another and nowhere gives any absolute measure of value.

It seems, however, that among the other things in italics, he states that cod liver oil, given with egg albumen and calcium acetate, is the best for nursing infants.—*W. G. Stern, Cleveland, O.*

RACHITIS. Ernst Schloss. *Berlin. klin. Wochens.*, January 31, 1916, p. 106.

Abstracted in *Jour. A. M. A.*, March 18, 1916, p. 926.

Schloss has made a special study of the skulls of infants at an orphan asylum at Berlin, in addition to the infants of his private practice. From the findings in this large material, compared with those reported by others, it seems evident that the skeleton of from 20 to 80% of the infants examined was incomplete at the time of birth. This hypoplastic condition of the skeleton is especially noticeable in the delay or retrogression of the ossification of the skull. It is chemically evident further by a local or diffuse lack of adequate bone-forming salts. The ultimate cause of this unfinished condition of the skeleton is still a problem. It is not rachitis, but it provides an exceptionally good soil for rachitis, and may even be regarded as affording a predisposition for it. But rachitis may develop when there is little or none of this predisposition.—*Roland Hammond, Providence, R. I.*

## V. SCOLIOSIS AND STATIC DISTURBANCES.

FUNCTIONAL RENAL TESTS IN ORTHOSTATIC ALBUMINURIA. Lewellys F. Barker and F. Janney Smith. *Amer. Jour. Med. Sciences*, January, 1916.

The writers report six cases, each having a definite increase in the lumbar lordosis, each showing the excretion of albumin in the urine when the

patient was in the erect position, and the disappearance of albumin from the urine when the patient assumed the horizontal position.

The phenolsulphonephthalein test was made in all of these cases, with the result that the excretion of this substance was entirely normal in four cases, was 5% lower than the usually accepted normal in one case, and in the other it was 14% lower with the patient standing than when made in the recumbent position.

The writers suggest that, in certain instances, at least, a movable, or a prolapsible kidney may be a factor in so-called orthostatic albuminuria.—*Arthur J. Davidson, Philadelphia.*

## VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.

MULTIPLE CARTILAGINOUS EXOSTOSES (HEREDITARY DEFORMING CHONDRODYSPLASIA). REPORT OF CASES. A. P. C. Ashhurst. *Annals of Surgery*, February, 1916.

The author believes the affection is not really so rare, but merely has been ignored because so little can be done by treatment. He gives abstracts of 15 cases which have come under his observation, 9 of which have hitherto been unpublished. Owing to lack of details, the author states that the diagnosis of two is uncertain. Three cases presented single exostoses, but are classed as examples of chondrodysplasia and two others were "utterly different types of cases"; one a traumatic hyperostosis, and the other an instance of osteophytes accompanying chronic hypertrophic arthritis.—*J. J. Nutt, New York.*

HOMOPLASTIC TRANSPLANTATION OF BOILED SEGMENT OF RADIUS. C. A. McWilliams. *Annals of Surgery*, February, 1916.

For sarcoma, Brewer excised lower  $2\frac{3}{8}$  inches of the radius. Six days later defect accurately filled with the graft. Healing by primary union. Case followed for 1 1/2 years. Röntgenogram taken, and result supposed to have been good. Three and one-half years after the operation, hand was abducted and dislocated from the ulna and function was much impaired. Röntgenograms showed upper  $\frac{2}{4}$ ths of graft completely regenerated and united to old bone, the adjoining fourth incompletely regenerated, and the lower fourth completely absorbed. The literature of both living and dead homoplastic transplantations is reviewed.—*J. J. Nutt, New York.*

## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

SYMMETRICAL CONGENITAL MALFORMATION OF EXTREMITIES. REPORT OF TWO CASES. S. W. Boorstein. *Annals of Surgery*, February, 1916.

Boorstein is under the impression that only a small number of individuals with short metacarpals and metatarsals are on record. Their condition should be searched for and reported to clear up the etiology of congenital abnormalities.

One case presenting shortening of the fourth metacarpals and the fourth metatarsals gives a history of nine members of the family having the same defect. The other case showed shortening of the fifth metacarpal. There was no one in her family who had a similar deformity.—*J. J. Nutt, New York.*

CONGENITAL KYPHOSIS. David M. Greig. *Edinburgh Medical Journal*, February, 1916.

A healthy boy of two years and six months exhibited an obvious projection

in the upper dorsal spine. He was a full term baby and birth was normal. No abnormal symptoms complained of at any time. As the boy sat with hands symmetrically in front of him, the spinous processes of the dorsal vertebrae appeared accurately superimposed. Passing upward, a prominence seemed to be produced, however, by forward displacement of the fifth or sixth cervical vertebra; but indistinct shadows in radiograms indicate defective development in anterior parts of bodies of first dorsal or seventh cervical vertebrae as the cause of the kyphosis. Associated with this variation is a cervical rib, also one slightly elevated scapula, and what appears to be fusion of the second and third ribs.

The case is reported on account of its rarity; and embryological and developmental possibilities are discussed. Illustrations consist of one photograph of the patient's back and one radiogram of the spine. It is an interesting, completely prepared report upon one case.—*H. W. Marshall, Boston.*

CONGENITAL HIGH SCAPULA. W. Hoffman. *Jahrb. f. Kinderheilkunde*, January 1916, lxxxiii, No. 1.

The reason for publishing this report of a solitary case of congenital elevation of the scapula is not evident in the article.—*W. G. Stern, Cleveland, O.*

CONGENITAL ANTERIOR CURVATURE OF THE SPINE. REPORT OF CASE. Samuel Kleinberg. *Journal A. M. A.*, March 4, 1916, p. 736.

Kleinberg reports a case in a child of four months of anterior curvature of the spine, or congenital lordosis, which was apparently not secondary to any other condition, and is consequently an extremely rare condition, judging by the infrequent mention of primary congenital lordosis in the literature. Efforts to change or reduce the curve were unsuccessful. An interesting feature of the case was the absence of albuminuria.—*Eben W. Fiske, Boston.*

#### VIII. TRAUMATIC LESIONS, FRACTURES AND DISLOCATIONS.

INJECTIONS OF FIBRIN TO STIMULATE THE PERIOSTEUM TO PRODUCTION OF CALLUS.

S. Bergel. *Berlin. klin. Wochens.*, January 10, 1916, p. 32. Abstracted in *Jour. A. M. A.*, March 11, 1916, p. 844.

In cases of delayed healing of fractures and for pseudarthrosis, Bergel makes local injections of fibrin obtained from blood drawn from horses. He gives a number of roentgenograms, which apparently demonstrate that by this means the production of callus is stimulated and pseudarthrosis corrected.—*Roland Hammond, Providence, R. I.*

ARTIFICIAL IMPACTION OF HIP FRACTURE. F. J. Cotton. *Annals of Surgery*, March, 1916.

Working along the lines first laid down by Shaffer, Whitman has contributed to the attainment of real results, but would be in a stronger position had he differentiated his cases. Results are inconclusive if not classified as extracapsular or intracapsular. The former unite with any treatment, while unimpacted fractures of the femoral neck proper never unite by bone and well-impacted fractures do so unite, almost always. The author believes the unimpacted can be converted into an impacted fracture, within a fortnight, without damage and without great difficulty. He reports 21 cases, with 1 failure and 1 perspective failure. Four were extracapsular and could have been treated as well by the Whitman method, or even better by the Phillips-Maxwell-Ruth method of traction. The technic is described.—*J. J. Nutt, New York.*

**FRACTURES OF NECK OF SCAPULA.** J. M. Hitzrot and R. W. Bolling. *Annals of Surgery*, February, 1916.

Facts contained in this paper are based upon nine cases reported in detail and a series of experiments on the cadaver.

The conclusions are: that the description of the deformity ordinarily given is not correct and there may be no recognizable deformity; that the clinical manifestations are insufficient to make a positive diagnosis and the X-ray is essential; that a Velpeau or similar bandage is all that is essential for treatment and manipulative efforts have no effect upon the displacement which occurs in the line of fracture; that careful after-treatment gives perfect functional results and ill-advised attempts at correction are to be condemned. If a bad functional result is threatened owing to displacement, operation is indicated.—J. J. Nutt, New York.

**ARTIFICIAL PERIOSTEUM FOR FIXATION OF SHAFT FRACTURES.** J. B. Roberts. *Annals of Surgery*, February, 1916.

The success of Straus with woven catgut rugs or splints in treating experimental fractures in dogs, leads Roberts to suggest an autogenous fascial graft. The mechanical principle is that a firmly placed tube or wrapping of flexible tissue around a broken rod or bone prevents displacement.—J. J. Nutt, New York.

**BIRTH FRACTURES OF THE HUMERUS FROM WARDS OF NEW YORK LYING-IN HOSPITAL.** E. D. Truesdell. *Archives of Pediatrics*, September, 1915.

"It may be concluded that in a case of birth-fracture of the humerus a temporary paralysis of the musculospiral nerve is usual, that displacement of the fragments always occurs, the variety or degree of deformity being known only by means of radiographs, and that while every effort should be made to combat this deformity, Nature will so supplement the treatment of these cases as to ensure satisfactory results, eliminating deformities during the first two years of life that would be both permanent and disfiguring in adults."—Ellis Jones, Los Angeles.

#### IX. MISCELLANEOUS DISEASES, GENERAL ORTHOPEDIC ARTICLES, PHYSICAL THERAPY, APPARATUS, ETC.

**A UNIVERSAL ORTHOPEDIC APPARATUS.** Peter Schmidt. *Deutsche medicin. Wochenschr.*, February 10, 1916, p. 165.

The author describes a simple, ingenious device for mobilization of stiffened and partially ankylosed joints in field hospital work. It is designed to replace cumbersome and expensive Zander apparatus where such cannot be obtained. When set up for exercising the knee-joint, it is not unlike a large wooden posterior splint with joints at the knee and ankle, and a sole plate to hold the foot at a right angle. Straps hold the thigh, leg, and foot firmly against the board, and a weight suspended on the wall or floor and employing a simple system of pulleys, furnishes the resistance against which the muscles act. It is conveniently placed on an ordinary table. By simple changes in the apparatus, it can be adapted for exercising the elbow, wrist, and finger joints.—Roland Hammond, Providence, R. I.

**A CASE OF SYMMETRICAL GANGRENE OR RAYNAUD'S DISEASE ASSOCIATED WITH EPILEPSY.** David F. Weeks and D. S. Renner. *Journal A. M. A.*, February 26, 1916, p. 651.

This is a report of a case of rapid and progressive gangrene affecting both



legs in an Italian epileptic. Death resulted in twenty-three days, the patient having five grand mal convulsions during this time. As to whether this association of Raynaud's disease with epilepsy may be dependent on a single etiologic factor, or the condition reported was purely coincident, nothing is said in this article.—*Eben W. Fiske, Boston.*

## X. WAR SURGERY.

### BOARD METHOD OF IMMOBILIZATION FOR COMPOUND FRACTURE OF THE FEMUR.

L. Duvernay. *Paris Médical*, No. 6, 1915.

Fractures of the femur received on the battlefield need not only apposition of the fragments and fixation of the adjacent joints, but also frequent dressings on account of infection. For these fractures the author has devised a simple dressing consisting of a well-padded splint 1 m. to 1 m. 10 cm. in length and 5 cm. wide. The portion which lies under the wound is covered with some impermeable substance such as rubber tissue. These splints can with little motion of the fractured leg be slipped under the patient. Its upper end extends as far as the axilla; its lower end to the ankle. The narrowness of the splint allows it to lie between the tuberosity of the ischium and the trochanter. These prominences hold it in place. It is also held by broad bands around the abdomen and leg. Such a splint allows a full view of the wounds for dressing. Extension can be easily applied.—*DeForest P. Willard, Philadelphia.*

### EXPERIENCE WITH 80 CASES OF WAR WOUNDS OF JOINTS. Kaehler. *Med. Klinik.*, January 9, 1916, xii, No. 2.

The writer deplores the fact that it has been impossible for the large German military hospitals to keep their records intact.

The eighty cases reported were a mere fraction of those under observation at the time, but their records had been duplicated and, therefore, not lost.

The methods of treatment used were the most conservative. It is the writer's opinion that shrapnel wounds were the least serious of all the various types seen in modern war.

Wounds were considered clean until they showed signs of infection. They were cleansed with iodine and the parts placed at absolute rest. The author holds the latter to be the best preventative and therapeutic measure against infection. Exact bandaging and exact fixation is a "sine qua non," and Kaehler complains that the younger generation of medical men have not learned this art.

Perfect drainage must always be instituted, and he resorts to continuous saline drips so that the dressings can really absorb.

Bier's treatment of acute infections (Bier's Hyperemia) is worthless.

Thirty-six of the eighty cases healed without infection.

There are few cases (primary amputations, ligation of vessels, etc., excepted), which cannot be given from 12 to 48 hours, to see whether or not they will become infected.

He fails to mention prophylactic injections of antitetanus serum.

All treatment must be individualized: routine treatment of injuries has no more place in military surgery than in casualty surgery in times of peace.—*W. G. Stern, Cleveland, O.*

### IMPORTANCE OF IMMOBILIZING DRESSINGS IN TREATMENT OF WOUNDS OF BONES AND JOINTS. W. Körte. *Berlin. klin. Wochens.*, January 3, 1916, p. 1.

The author believes that in injuries of the bones and joints received in

battle, rest and fixation of the part is the first essential because the patient must be transported to a base hospital and spared unnecessary pain. For this reason, extension should never be used in emergency fixation of fractures. He discusses the different materials used in the temporary splinting of fractures,—wood, metal and plaster of Paris. Plaster should rarely be used for an emergency dressing. The general rules for treating fractures, such as splinting the joint on either side of the fracture, the proper padding of splints, and the proper position for putting up the different fractures, are given.—*Roland Hammond, Providence, R. I.*

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TREATMENT OF INFECTED GUNSHOT WOUNDS OF BONES AND JOINTS. By W. Körte. *Berlin. klin. Wochensch.*, January 10, 1916, p. 30.

At the beginning of the war, infection of gunshot wounds, even those involving bones and joints, was infrequent, while shrapnel and shell wounds with great loss of skin frequently became infected. Later it was noticed that these gunshot wounds easily became infected. Körte believes that it is due to trench life. Earth sticks to the hands and clothing, and proper hygiene of the body is difficult. He believes the following factors tend to wound infection: (1) the necessity of lying on the ground, especially if the ground is boggy, before the wound is dressed; (2) lying on straw with insufficient wound dressing; (3) inefficient fixation of injured limbs; (4) long transportation without firm bandage. As soon as signs of infection are noted, the wound should be laid open by a generous incision and well drained. Early interference will often prevent a prolonged suppuration. Chemical antiseptics are to be avoided as they only injure the tissues and do not prevent spread of infection. In the later stages, camphor two parts, and liquefied carbolic acid one part, or chloride of calcium one part and talcum nine parts or balsam of Peru assist granulation. Bier's hyperaemia is of considerable value in some cases. Wright's 5% saline solution with the addition of one-half per cent. citrate of soda causes marked lymphorrhoea, which assists in throwing off infection. Whitehouse uses a solution of grape sugar with 1 to 80 carbolic acid. Delbet uses 8 per mille saline solution, or better, 12 per mille magnesium chloride solution to assist phagocytosis. Dakin and Carrel recommend the abortive treatment of wounds with a one-half per cent. solution of hypochlorite of soda. This solution must be used during the first six hours. In infections of the joints the knee,—which is most often involved,—should be freely incised, drained and placed in semiflexion. Resection should rarely be resorted to. Hip-joint infection is the most serious and should be treated by free drainage. The best prophylaxis is the prevention of infection.—*Roland Hammond, Providence, R. I.*

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PRIMARY RESECTION OF WOUNDED ELBOW: INDICATIONS, TECHNIC AND AFTER-TREATMENT. R. Leriche. *Journal de Chirurgie*, September, 1915, xiii, No. 4.

The author believes in primary resection in all cases of elbow injuries from gunshot,—in the severe cases, because it is the best method of preventing suppuration; and in the more mild cases, because it prevents ankylosis.

The author describes at length his technic. He prefers the bayonet incision, the upper arm of which is external to the humerus and the lower arm posterior to the olecranon. He uses no skin suture and dresses the arm in acute flexion, and after the fifth day uses heliotherapy on the wound. As soon as the temperature is normal and the pain ceases, gentle passive motions are begun.—*DeForest P. Willard, Philadelphia.*

**RESECTION OF ELBOW FOR ANKYLOSIS CONSECUTIVE TO GUNSHOT OR SHELL WOUNDS.** A. Mouchet and R. Gouverneur. *Journal de Chirurgie*, September, 1915, xiii, No. 4.

The authors divide these cases into two classes: Group 1, those in which cicatrization is complete; Group 2, those in which it is incomplete and in which a suppurating tract persists. Under Group 1 the authors advise operations on cases in which ankylosis is at an obtuse angle, and also advise operation in cases ankylosed at right angle, if the hand is in marked pronation, if it is a recent case with signs of nerve pressure, if the muscles are not atrophied, or if the bone destruction is not extensive.

Under Group 2, recommend operation if the arm is in bad position and if the discharge from the sinus is slight and sero-purulent in character.

The authors advise an arthrodesis with large resection of bone or a subperiosteal resection to give solid ankylosis in good position. They recommend a median posterior incision, and believe that 4 to 4½ cm. of bone may be removed. The arm is dressed at right angles, with the hand supinated. Passive motion is begun in 10 days if possible. Authors report 18 cases, with excellent results.—*DeForest P. Willard, Philadelphia.*

**EXTENSION AFTER FRACTURE OF THE THIGH IN WAR.** Roschke. *Münchener med. Wochenschrift*, Aug. 10, 1915, LXII, No. 32.

Roschke describes an apparatus for the treatment of gunshot wounds of the femur. The apparatus is a modification of the double inclined plane and resembles the usual apparatus used in treating such fractures with the thigh flexed and the leg elevated.—*F. D. Dickson, Philadelphia.*

**TREATMENT OF FINGER WOUNDS.** H. Schloffer. *Med. Klinik*, December 26, 1915, xi, No. 52.

With the exception of the thumb, gunshot wounds of the fingers which are at all severe or infected, call for immediate amputation, as the results of conservative treatment give rather stiff and useless extremities. The only excuse the author can offer for the above vicious rule is the statement that the loss of any of the fingers (the thumb excepted) is not a serious affair and the men can be returned to their military duties (minus a few fingers) in a few weeks' time; while it takes months to save a finger and restore its function.

According to the writer, the amputations should be performed at the first dressing station.

Luckily for the Bohemian troops under his care, the author admits that for many reasons he could not carry out his scheme of routine amputations.—*W. G. Stern, Cleveland, O.*

**THE USE OF DISTRACTION HOOKS FOR THE TREATMENT OF BONE INJURIES IN THE FIELD.** A. Schnee. *Münchener med. Wochenschrift*, 1914, No. 46.

The author has had good results in fractures of all kinds with this apparatus, and recommends its use. It possesses, among others, the advantages that a proper position of the fragments having been determined by x-ray, the patient can be up and doing something for his support. In fractures of the lower extremity this is left free for movement.—*F. D. Dickson, Philadelphia.*

## AUTOREGULATING EXTENSION DEVICE FOR COMPOUND FRACTURE OF THE FEMUR.

L. Senleq. *Paris Médical*, No. 14, 1915.

The author describes the apparatus for immobilizing fractures of the thigh and giving extension and easy access for dressing of infected wounds. The apparatus consists of a plaster jacket from the chest to the trochanter, and the plaster cast from the knee to the toes. Fixed in these plaster dressings are steel tubes, the lower one to be hollow, and the upper one solid. The upper tube fits accurately into the lower. Both are supplied with adjustable metal collars. Between these collars are spiral springs, which tend to force the rods apart. By moving the collars the tension of the springs can be regulated and the required amount of extension given.—*DeForest P. Willard, Philadelphia.*

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MOBILIZATION IN TREATMENT OF WOUNDS OF WAR. H. Somen. *Paris Médical*. No. 17, 1915.

Active passive movements of injured joints should be undertaken by an expert masseur. First passive motions are begun, then active motions, and later active motions with resistance should be given, always under expert supervision. These movements are for two purposes, to give freedom of movement to joints, and to strengthen the muscles that move the joints. The main principle in giving these exercises is to restrict the movements to one joint or to one group of muscles and to prevent the adjacent joints and muscles from entering into the movements. The author gives in detail the methods used in joints of the upper and lower extremities.—*DeForest P. Willard, Philadelphia.*

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A DEVICE FOR MAKING PASSIVE MOTION IN THE SHOULDER. A. E. Stein. *Münchener med. Wochenschrift*, July 20, 1915, LXII, No. 29.

Stein describes a cheaply constructed apparatus available for use in any situation for making passive motion in a shoulder-joint rendered stiff by gunshot wounds or other injury.

To prevent movements in the scapula, which is necessary if we are to get motion in the shoulder-joint itself, Stein uses a strap of webbing or other similar material, 8 cm. broad, which passes over the injured shoulder, under the foot on the sound side, and up to the wounded shoulder again. This strap can be tightened to the desired extent by a buckle. The remainder of the apparatus consists of a pulley fastened overhead, through which passes a rope with a handle at each end. One handle is grasped by the hand of the injured side, with the elbow extended, and the patient with the sound arm gives the passive motion by pulling up and down on the other end of the rope.—*F. D. Dickson, Philadelphia.*

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BRIDGE DEVICES FOR SECURING EXTENSION AND MOTION IN PLASTER CASTS. J. Stoeger. *Münchener med. Wochenschrift*, July 6, 1915, LXII, No. 27.

Stoeger has used for some time a bridge device for applying plaster casts to suppurating joints and also in the treatment of fractures about joints. It is used in two forms; one the usual strap iron bent in the ordinary way, to which is attached at each end a roughened and perforated lead plate, which readily takes the form of the surface to which it is applied and becomes firmly fixed with a few turns of plaster. In the second form a stop joint is applied in the same manner, mounted with a set screw, so that extension can be made. This device allows of constant extension and permits the joint being moved

without removing the cast. This is also an arrangement for making extension by means of a strong spring, the mechanism of which should be studied in the original article, which is illustrated.—*F. D. Dickson, Philadelphia.*

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**PRIMARY RESECTION OF THE KNEE JOINT AS TREATMENT OF COMMINUTED FRACTURE OF THE LOWER END OF THE FEMUR.** Charles Viannay. *Lyon Chirurgical*, Oct. 1, 1915.

The author states that gunshot wounds of the knee-joint, causing comminuted fractures are always septic, and that he has come to the conclusion that in such cases an excision of the joint should be performed inside of 48 hours from receipt of the injury; free incisions, he thinks, are not sufficient to prevent infection.

He opens the joint by a curved incision passing through the orifices of entry and exit. Blood clots are cleaned out and fragments of the condyles removed subperiosteally. The patella is removed, the synovial sac under the quadriceps tendon is excised in order that every part of the articular cavity may disappear. Often foreign bodies, as pieces of clothing, need removal. The articular surface of the tibia is sawed off, and the sharp irregular end of the femoral shaft is implanted into the spongy tissue of the head of the tibia. The wound is drained and over all a fenestrated dressing is applied. The author considers that by this operation his patients have escaped the terrors of a septic knee joint.—*J. A. Nutter, Montreal.*

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**TREATMENT OF GUNSHOT WOUNDS OF THE FEMUR BY MODIFIED THOMAS SPLINT.** C. Wallace and B. C. Maybury. *Lancet*, Sept. 4, 1915.

Gunshot wounds of the present war are demanding great ingenuity and resource on the part of the English war surgeons. In this article Wallace and Maybury give a second report of their use of the modified Thomas splint in comminuted femoral fractures. The *Lancet* publishes a supplement to exhibit nine plates showing the original findings in the severe fractures treated and the end results of this form of treatment. Remarkably good results are shown. In the text two plates are presented illustrating the parts of the modified splint. The salient features are a transverse crotch ring instead of the usual oblique one, and an extension ratchet at the foot in place of the cross arm. The brace is shown modified for plating the femur by substituting for the side bar of the brace a cranked bar. Since the authors' first report on the subject they have substituted for the sand bags and pillows used for immobilizing the trochanter a wedge-shaped pad of felt, which is pushed between the crotch ring and the trochanter. Taken all in all, the use of this modified brace in this class of fracture work seems a splendid procedure.—*E. A. Rich, Tacoma.*

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**THE PROBLEM OF ARTIFICIAL HANDS AND ARMS IN WAR INJURIES.** O. Witzel. *Münchener med. Wochenschrift*, November 2, 1915, LXII, No. 44.

This article does not lend itself to abstract, as it deals chiefly with the mechanical problem of securing function in artificial arms. It should be read in the original with illustrations.—*Frank D. Dickson, Philadelphia.*

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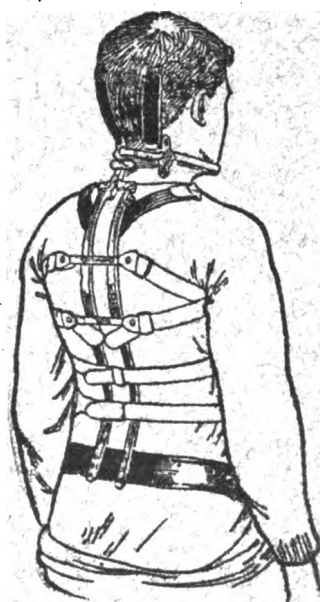
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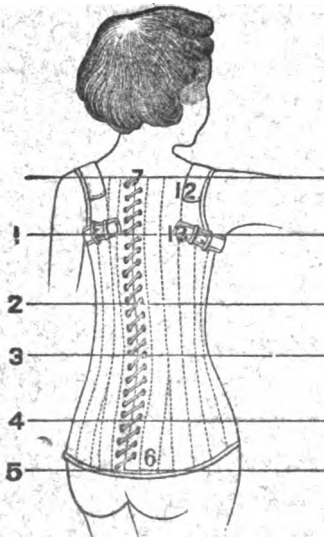
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## Symposium on Infantile Paralysis

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### OPERATIVE TREATMENT OF INFANTILE PARALYSIS.

BY MARK H. ROGERS, M.D., BOSTON.

THIS report is based on a study of the cases of infantile paralysis which have been operated upon at the Massachusetts General Hospital during the last eight years. This will be a review of the types of operations used and our reasons for their various uses.

The total number of cases on which this report is based is 130. The arrangements of the orthopedic service are such that we have a larger proportion of adult cases than children. This fact, that we have more adult orthopedic cases, allows us to obtain a different viewpoint of infantile work than is possible in a clinic confined wholly to children, because we can observe not only the results of the operative work done in childhood, but also we can observe the end-results of the non-operative cases, and can look at the problem from both points of view.

The operative work is done by a staff of five surgeons, who are on service at different periods, working under the direction of a chief-of-service. Each man is free to work as he chooses, but we are certainly influenced very much by the head of the department, and therefore the type of work is quite uniform. Practically every case is discussed by several members of the staff before operation and this tends also to make our work more uniform. We have never committed ourselves to any one method of operating, and therefore we cannot report the results of



any extended series of a given type. Rather have we attempted to discuss a given case carefully and select that method that seemed most applicable.

The difficulties of obtaining material for this paper have been lessened because, within the last year, Drs. Marshall and Osgood have made a careful detailed study of the end-results of twenty-six cases of foot-deformities which have had a major orthopedic operation. In their study they did not include any of the simpler tenotomies or osteotomies, and they excluded all cases that had been done within two years. This represents practically every case with a major foot lesion in which they could personally establish the end-result. Also I have made a study of the records of all the cases, so as to show what we have done, and why it was done.

Of the total number of 130 cases there were 79 over 12 years of age and 51 under 12 years. It is necessary to divide our cases into two general groups, adults and children, because the problems in the two cases are somewhat different, and what may be a good operation in a child is not sufficient in an adult. It was necessary to assume an arbitrary age limit, and the age of 12 was adopted because most of the cases in the Children's Hospital in Boston are below this age, and because the children over 12 begin to present the problems that we meet in adults.

Our general policy in regard to operations in the case of children is comparatively conservative, because we believe that, unless there are strong indications to interfere operatively, the results are better in older cases, when there can be better coöperation on the part of the patient and that the results are more sure. If it is possible to keep control of the case so that we can know when deformity begins to develop, we believe it is better to postpone operation, even if we have to continue the use of braces. We are influenced towards this viewpoint by seeing a good number of cases that have had multiple operations during childhood and still present definite deformities. Of course we appreciate that these cases of relapse are probably difficult and uncontrollable cases, in which too much dependence was put upon the operation and not enough upon the after-care on the part of the patient. And we do believe in operative interference in any case where a light brace is not sufficient, and especially where there is developing an increasing deformity in spite of the brace.

The type of case that needs attention is not always the flail foot with complete paralysis, for many of these without deformity show remarkably good function after they have become accommodated to such a

condition, but rather the case that shows a paralysis of one group of muscles and a powerful antagonistic group. For example, if the anterior tibial is paralyzed and if the peronei are very strong, then there will surely develop a deformity of valgus. Also, if the peronei are paralyzed and the anterior and posterior tibial are strong there is sure to be a varus. Now if we follow our general principle of not operating on children, there would be developed a bony deformity in adult life for which it would be necessary to perform one of the radical bone operations.

Under such conditions, when we feel that deformities are bound to occur, we do advocate an operation, and this brings us to a discussion of the value of Whitman's astragalectomy, silk ligament fixation, tendon transplantation and tendon fixation.

Our records show that we have performed the Whitman operation in cases under 12 years of age only three times, and in only those cases of marked calcaneus, and the known results have been good. We believe that this method could be applied to many other cases, but we prefer to wait until the child is older except in calcaneus, where it is difficult to hold by other methods.

Silk ligament fixation as a means of permanently holding and preventing a deformity in a growing child has never seemed to us an adequate procedure, based on certain cases that have had this done in other clinics which came to us in adult life. We do not believe that this method can permanently oppose a constant pull from a healthy muscle, and for this reason we have never used it to any extent by itself, but only in connection with a transplantation.

Tendon transplantation has a definite field in our treatment of infantile paralysis, and in studying the end-results we find that the general average of the cases has been satisfactory. The indications for transplantation are paralysis of one group of muscles while the opposing group is active, which condition is bound to produce a deformity. In children this deformity may not be marked, but the constant pull of the healthy muscle is the greatest factor in producing the bone deformities that we have to deal with in adults. Therefore the function of a transplant is not only to take up the function of a paralyzed group, but also to take away a vicious pull that will cause a deformity.

In children, according to the records, our work has been confined chiefly to transferring the anterior tibial into the cuboid, and the peronei either between the tibia and fibula or in front of the fibula into the scaphoid. We have no records of multiple transplantation, probably because the policy of the department has been so conservative, and

because we have demanded a perfectly clear-cut reason why we should interfere.

Tendon fixation has been employed to a considerable extent during the last two years, and, so far, we have been impressed by this method. It is probable that a tendon fixation is not sufficient to oppose the continuous pull of a healthy muscle, and that we will have to use transplantation in many cases with fixation. Not sufficient time has elapsed to be sure of the final results, but at the present it seems possible to prevent deformities, especially in children. But whether it can be used in older children and adults, appears to be an unsettled question as yet. This year there have been two cases, 15 and 18 years old, in which there was a definite relapse into the old position within six months, and the probable reason in both cases was that there was a failure to perform a tendon transplantation at the same time. Still we believe that there are indications for its use in growing adults, and I have just seen an end-result where fixation was very evidently holding well in a girl 17 years of age.

This brings us to a discussion of our work as it is related to those cases over 12 years of age. The 79 cases of the adult type may best be taken up in various groups into which they naturally can be divided. We will first consider the question of tendon transplantations as applied to cases over 12 years of age; second, the comparative results of arthrodesis and astragalectomy.

There were a certain number of cases that presented themselves with multiple deformities, which were the results of extreme paralysis with marked contractures. These cases demanded various operations, generally to get them ready for braces and crutches, such as osteotomies for knock-knee and dislocated hip-joint. Undoubtedly our methods are the same as at any other clinic, and need no discussion here.

*Tendon Transplantation in Adults.* There are two types of deformity of the foot in which we find that a transplantation has given definitely good results, and our work has been confined chiefly to these. The first is the simple deformity of equino-varus, together with a moderate pes cavus and a lowering of the head of the first metatarsal. In our experience this is a very frequent deformity in adults, and the transplanting of the extensor longus pollicis into the head of the last metatarsal, together with a lengthening of the tendo Achilles has given uniformly good results.

The second type is a moderate equino-varus, where a strong anterior-tibial is transplanted into the outer side of the foot after there has been removed whatever bone deformity is necessary to correct the fore-foot.

In these cases we do not believe that the bone operation would always be sufficient if we left the offending tibialis anticus to continue its normal pull.

We have no records of multiple tendon transplantation in adults, and we do not believe that it is proper to expect a transplant to correct a deformity by itself, nor to take up function as we might expect in younger children. But a wisely planned transplantation, especially in conjunction with some other method to correct the deformity, seems to have proved of benefit. Our failures have been because we did not plan a sufficiently major operation, and did not do enough bone resecting, and depended too much on the soft parts and tendons.

*The Use of Astragalectomy or Arthrodesis in Adults.* The most interesting problems that we have to deal with are those cases which present marked deformities of the foot, in which it is impossible to correct by the simpler methods. This means, where the vicious leverage and deformity occurs at the astragalo-tibial joint. We take it as a general principle that adults should not be compelled to wear braces to hold the ankle joint, except in those cases where it is necessary to wear braces to support the whole leg. Even in these cases it is of advantage to have a foot that presents no deformity.

Such cases require either an arthrodesis or an astragalectomy to correct and hold a deformity at the ankle joint. Which one of the two operations is the better suited to give a good end-result? We have records of 13 astragalectomies in cases over 12, and 13 arthrodeses in cases over 12. The end-results in cases which have been operated over three years ago have been studied by Marshall and Osgood.

Their report reads that: "Seven astragalectomies showed useful, very stable feet in four cases, slight instability in two cases, and serious instability in one case. Arthrodesis of the ankle-joint yielded solid useful ankles in good position three times. One was stable and useful with a few degrees of motion in the joint. Two relapsed into their former bad conditions, and one was followed by a successful astragalectomy."

As far as this small number of cases goes, there seems to be a balance in favor of astragalectomy. The one case, which is recorded as a failure, because the patient was not able to walk better than before the operation, shows that there was almost complete paralysis of the thigh and a dislocated hip. The condition of the foot before operation did not show very marked deformity, so that in all probability there was an error in judgment in operating at all.

The figures as regards arthrodesis show 50% failures. Three cases were reported as very improved, and in two there was a definite relapse

into the old deformity. This is not as good a showing as we have made with astragalectomy.

In looking over the records it is quite evident that there has been a gradual change of view in the last few years, away from arthrodesis to astragalectomy. Up to 1910 the majority of operations for a major lesion were arthrodesis, but since that time we have been inclined to do an astragalectomy to accomplish the same results. This tends to show the general feeling of the staff, although we have never arrived at the conclusion that arthrodesis under all circumstances was an improper procedure.

In performing an astragalectomy there have been two cases which had to be operated upon a second time on account of poor position. It seems absolutely essential to take great pains in remodelling the bones so that the foot can be set backwards to allow the proper weight-bearing. This is much more difficult in an old deformed foot, because after the astragalus is removed it seems as if there was no place into which the os calcis could rest.

It requires much more dissection and removal of bone from the scaphoid and cuboid to allow the foot to set up and back between the malleoli than it does in children. But this has seemed to us to be absolutely necessary, and the failure to do this has been the cause of our bad results. These were fortunately overcome by a second operation with good results.

The final result should show a foot with good weight-bearing and with practically no tendency to a lateral displacement. This also allows a few degrees of motion, which is of decided benefit. There was one case of double infantile club-foot in a young adult, in which case an arthrodesis was performed on one foot and an astragalectomy on the other. Later, on account of non-union and the fact that the astragalectomy gave him such a useful foot, he asked for an astragalectomy of the arthrodesed foot, and the final result was satisfactory. It is quite evident that it takes a longer convalescence to obtain a good result, that is, to be sure of ankylosis in a good position, in an arthrodesis than in an astragalectomy.

This, then, is an attempt to express the views of the staff, dealing more with adults than with children, based on a comparatively small number of cases, the end-results being carefully studied within the last year, and all detailed records gone over so as to obtain a proper viewpoint as to why we did certain operations, from which we may look back, analyzing our success and failures, and from which we may look forward, planning our future course and policy.

Our conclusions are:

1. It is better to do as small an amount of operating as possible in children, as long as there is no development of deformities. The various methods have proven of value, the matter of chief importance being a careful study of the needs of the individual case.
2. In adults, the results of tendon transplantation, alone or combined with resection of portions of the bony structure, have given good results. The Forbes operation is of definite value.
3. Astragalectomy has given better results than arthrodesis of the ankle-joint in those cases which present very marked deformity.

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## METHODS OF STABILIZING THE FLAIL FOOT IN INFANTILE PARALYSIS.

BY EDWIN W. RYERSON, M.D., CHICAGO.

MANY of the operative procedures used in the treatment of paralytic conditions have become practically standardized in the last few years. Tendon transplantation has demonstrated its usefulness in cases where it is suitable. Whitman's operation of astragalectomy and backward displacement of the foot has won its place in the treatment of calcaneus deformities. Arthrodesis has a distinct field of usefulness in patients over fourteen years of age.

There is still much diversity of opinion, however, concerning the best method of treating the cases of very weak and flail-like feet, where all, or nearly all, of the muscles are paralyzed. The problem is one of great difficulty—to transform such feet into strong, stable, weight-bearing members which shall not become deformed under the requirements of every-day usage, and to be able to produce this result with uniform safety and success in patients of all ages.

This problem does not concern itself with transplantations or transferences of active muscles or tendons. Cases where such operations are possible do not come within the scope of this paper. Nor is the production of a bony ankylosis here to be considered, because the ideal operative procedure should be suitable for young children as well as for older persons, and experience has shown that arthrodesis is rarely successful below the age of fourteen.

The problem would be simplified if some harmless chemical or bacterial agent could be found which would produce a fibrinous or bony

ankylosis when injected into the joints. Experiments have been planned by the writer to determine the possible value of formalin in this connection, with the idea of tanning and shrinking the capsular ligaments. This was suggested by the work of Katzenstein in flat-foot, as reported in the *Deutsche med. Woch.* of July 23, 1914, but no work has as yet been performed. What, then, are the present approved methods of stabilizing the flail-foot, and what are their limitations?

#### SILK LIGAMENTS.

A few years ago a great deal of work was done, in various parts of the world, with cords of silk passed from the bones of the leg to the bones of the foot. Periosteal insertions were soon abandoned, and the cords passed through holes bored in the bones. Very many of these operations were entirely successful, and the writer has a large number of patients who are perfectly satisfied with the results, some of them having been operated upon as long ago as seven years. With increasing experience, however, certain other cases have disclosed defects in the method. In a few instances the cords have, after a long time, acted as foreign bodies, and have had to be removed. This occurred about as frequently when the bichloride silk had been paraffined as when it had not. The presence of the silk, therefore, is not always tolerated by the tissues, and the method cannot be said to be invariably successful from this standpoint.

Another objection to the silk cord suspension is that in several cases where the silk healed in perfectly, the foot gradually dropped down into the same equinus position which had existed before the operation. The reason for this could not be determined by the writer. In two other cases the silk was broken by an unexpected fall many months after the operation. It is, therefore, evident that the fibrous tissue deposited around the silk cord does not always furnish sufficient strength. Four cords of No. 12 silk were used in these two cases. It may be well to remember, however, that tendons and ligaments in normal persons may themselves be torn by violence.

Lastly, it was found extremely difficult to control lateral deviations of the foot by silk cords, even when separate cords were passed from the malleoli to the tarsal bones. Varus and valgus deformities recurred in many cases, although the foot-drop was entirely corrected.

It was concluded, therefore, that the silk ligament suspension could not invariably conform to all of the postulates above determined, and other methods were adopted.

The autogenous bone peg, or dowel, driven down through the lower end of the tibia and through the astragalus and os calcis, seemed to offer

easy and satisfactory immobilization. Several cases were operated in this manner, and the results were at first brilliant, but at the end of twelve or fourteen months the ankles were as freely movable as before the operation. The intra-articular portion of the graft undergoes degeneration and finally disappears entirely, without causing ankylosis. These results have been confirmed by other observers, and the method has been abandoned.

In three cases a broad strip of periosteum with a thin layer of underlying cortical bone was turned down from the tibia and fibula and sewed to the denuded surface of the astragalus and calcaneum. These cases were complete failures.

The method described by W. E. Gallie of Toronto was then employed in about forty cases. His directions were followed with care, and many of the results are perfectly satisfactory. The *tibialis anticus* has remained fixed in nearly all of the cases, but in several the lateral deformity, particularly the valgus, has not been sufficiently controlled. The operation is one of considerable technical difficulty, on account of the care necessary to prevent strain upon a tendon which has been fastened in place, during the time while the other tendons are being similarly fastened and the plaster-of-Paris dressing applied.

The suture through the periosteum has not seemed to be strongly enough placed to stand any marked stress, and, whenever possible, this suture should be passed through the bone as well. This is easy in small children, and in older ones stitch holes can be drilled. For six months the writer has been using the Gallie method of inlaying the tendon in the groove gouged in the bone, and in addition to this has drilled a hole through the bone at the upper end of the groove. The proximal portion of the tendon is now dissected up, cut off as high as possible, passed through the hole and brought down in loop-fashion to be sewed side by side to the portion lying in the groove. This is open to the theoretical objection that the nutrition of the tendon may be interfered with, and that atrophy or absorption may result, although so far no such observations have been made.

The groove cannot be made as long as is usually done by Gallie, since the tendon would not be long enough to loop through the bone, but the attachment, made as described, is so strong as to be almost unbreakable by any ordinary manipulations during the remainder of the operative procedures. When thus anchoring the peronei, the *peroneus longus* is displaced forward in front of the malleolus, placed in the artificial groove and passed through the hole bored in the fibula, turned downward in the peroneal sheath, and sutured to the *peroneus brevis*.



This method obviates those failures due to imperfect adhesion of the tendon to the groove in the bone, and those due to loosening of the fixation sutures during the operative manipulations, and it makes certain a firm tendinous suspension of the foot. The only question remaining unsolved is the actual strength and permanence of this tendinous suspension under the wear and tear of hard usage for many years. The evidence collected up to the present time seems to show that the results are excellent, and that the operation has a very distinct field of usefulness. It is best adapted to those feet which show little deformity, and, particularly, little tendency to cavus or hollow-foot. Where the latter condition exists, the instability of the foot should be conquered by a preliminary removal of the astragalus, and then followed by the artificial fixation of the tendons, as described above.

#### ASTRAGALECTOMY.

The original operation of Whitman has been so remarkably successful in the cases of calcaneo-valgus that various modifications have been made to adapt it to other conditions. In most of the weak, flail-like feet, careful study will show that the astragalus is the source of a large part of the instability. Its free motion in the antero-posterior plane beneath the tibia, and the large range of lateral mobility which it allows to the calcaneum and scaphoid, make it very undesirable in a flail or weak foot. This has long been recognized, as is evidenced by the operations designed to limit its functions. Among these operations may be mentioned the astragalo-scaphoid arthrodesis and the sub-astragaloid arthrodesis, as well as the older types of astragalo-tibial arthrodesis.

The only practical objection to the removal of the astragalus is the fact that a certain amount of shortening is caused by this operation. This shortening, however, is rarely more than three-quarters of an inch, and the stability gained by astragalectomy will usually more than compensate for the difference in length.

Many of the writer's cases of astragalectomy in which no attempt was made to secure stability by tendon fixation, have been held firmly in good position for many years. It must be carefully noted that in cases where any appreciable power remains in the tendo Achillis the tibia should not be displaced forward upon the foot.

In conclusion, therefore, the writer advises more frequent resort to astragalectomy in the feet which are very weak, and, in addition to the astragalectomy, a fixation of the tendons by the Gallie operation modified as above described.

## STABILITY OF THE LOWER EXTREMITY IN PARALYTICS.

BY GWILYM G. DAVIS, M.D., PHILADELPHIA.

THE lower extremity is constructed with two objects in view,—support and propulsion. Of these two, support is the more important, because propulsion is possible even when the mobile mechanism is deranged, provided support is present, but in the absence of support propulsion is obviously impossible. Therefore in treating paralyzes it behooves us first to secure support and then to promote propulsion to the extent possible. Efforts directed to improving propulsion are only efficient to the extent that they likewise promote stability. For this reason the attainment of stability in paralyzed lower extremities becomes our primary object.

Intimately associated with stability is the question of balance. Stability has largely to do with the bones and ligaments, but balance is largely controlled by the muscles. This indicates the lines of treatment necessary to remedy the disability incident to paralysis. A patient whose leg has been removed at the hip joint can substitute for it a supporting peg and still get around fairly well, but without a skeletal support either artificial or natural, the muscles are useless.

Recognizing, then, the fundamental necessity of a supporting mechanism, it is for us to endeavor to restore it when destroyed by disease. In poliomyelitic cases the grade of disability increases from the foot to the trunk. In the normal individual marked disabilities show themselves as follows: If the foot is involved it assumes a position of varus or valgus, if the joint beneath the astragalus is affected. If the ankle joint is affected the conditions of equinus or calcaneus result. It is true other disabilities result from a lessening of the efficiency of the other joints, but they are minor in character, and we now wish to consider fundamental principles. If what I shall call the sub-astragalar joint is the only involved part the disability is often not marked, and there are a number of means to which we can resort to stabilize it. In the order of their efficiency I would say: arthrodesis, fixation of tendons, transplantation of tendons and silk ligaments. The choice of methods, of course, depends on the indications of the individual case. However, even if the joint is completely obliterated, as in arthrodesis, the loss of function is comparatively slight. The ankle joint is close to the sub-astragalar joint and the paralysis produces most often toe-drop, or less often a condition of calcaneus.

If the condition is uncomplicated by paralyzes of the parts higher up, the necessity of its correction is sometimes not urgent. Even a well-

laced shoe may prevent a slight toe-drop from being troublesome. If the case is more severe the foot may be held up by fastening the extensor tendons or the peronei and anterior tibial to the anterior part of the tibia. In the cases of calcaneus usually associated with cavus, Gallie has proposed burying the tendo Achillis in the tibia posteriorly. Whitman's astragalectomy operations and the writer's horizontal transverse section through the tarsus below the malleoli are also done for the same object. Dropping of the anterior portion only of the foot can be corrected by arthrodesis of the scaphoid to the head of the astragalus. If the case is an extreme one, an arthrodesis of the ankle joint can be readily done, and even if not made absolutely immobile will usually have the extent of motion sufficiently restricted to be serviceable. Fixation of both the ankle and sub-astragaloid joints does not prevent the foot from being used with comparatively little loss of function. Thus it is evident that the static problems of the foot are, in one way or another, comparatively readily solved without the use of apparatus.

When instability of the knee is to be remedied, the problems become more complex. The main movement of the knee is simply an antero-posterior one. To extend it, the quadriceps femoris muscle contracts and to flex it there are the hamstring tendons; the biceps on the outer side and the semi-tendinosus and the semi-membranosus on the inner side. Additional aid is derived from the gracilis and the sartorius above and the two heads of the gastrocnemius and the plantaris below. These muscles act directly to flex the knee, and of them the hamstring muscles are the most efficient. Normally, stability is promoted by the hip joint tending to assume the position of extension, as is also the case with the knee joint.

The weight of the parts above is borne by the sacro-iliac joint. This weight is transmitted to the knee through the hip joint. The hip joint, being in front of the direct line of pressure between the sacro-iliac and the knee joints, assumes a position of slight hyper-extension which is prevented from becoming excessive by the strong ilio-femoral or Y ligament, and stability is secured. In the same manner the centre of motion of the knee joint is posterior to a direct line of pressure passing from the hip to the ankle; therefore it is pushed into a position of slight hyper-extension which is checked by the strong posterior aided by the lateral ligaments. It therefore follows that if we desire a stable lower extremity we must favor the assumption in the knee and hip joints of the hyper-extended position.

This is, of course, easy when the muscles are intact, but problems arise when they are paralyzed. Suppose the quadriceps, femoris is paralyzed,

is there much disability? Yes, there is liable to be considerable, but it is not apt to be absolute, because if the foot touches the ground other muscles may be called into use. Thus the glutei muscles, especially the gluteus maximus, come into play and tend to pull the femur back. As it is fixed and revolves in the hip joint, the lower end moves back and we find that children with intact gluteal muscles are much less crippled than those in which the glutei are paralyzed; indeed, paralysis of the glutei I regard as one of the most serious and disabling of those encountered. To restore lost stability to the knee various expedients can be resorted to. When the pelvis, on the affected side, is tilted up laterally and the leg is allowed to hang so that the toes touch the ground, comparatively little pressure is necessary on the front of the knee to put it in the position of hyper-extension. This may sometimes be obtained by transplanting into the patella the lower end of the sartorius, biceps, semi-tendinosus or semi-membranosus. This has been done, and not infrequently with success, but in my experience it has not been sufficiently efficient for me to employ the procedure in any but rare cases. Another means of securing a stable back knee is by fixation of the ankle joint. If the ankle joint is stiffened or ankylosed, say by an arthrodesis, with the heel slightly elevated, then when the body weight comes on the toes the heel descends and the knee, of necessity, is forced backward. The same effect is produced in those cases in which there is a shortened tendo Achillis, producing a slight pointing or dropping of the toes.

Stability of the knee is favored by its being in a position of hyper-extension. Many cases, however, instead of being hyper-extended are slightly flexed and incapable of being hyper-extended. Hence they are unstable. Frequently knock-knee is associated. When these conditions are present we have found an osteotomy of the lower end of the femur to be a desirable procedure. By this means the knock-knee is corrected and the joint placed in a position of hyper-extension, thus greatly increasing its stability. It might be urged that a deliberate production of a back knee is unadvisable on account of the danger of its becoming excessive. My experience leads me to think this is not so, for we have had several cases of excessive back knee, not resulting, however, from operation but from paralysis, which have been restored by wearing for some time an apparatus with a stop joint. The ligaments in such cases shorten and prevent excessive hyper-extension.

When the muscles controlling the hip and running from the trunk to the femur, especially the gluteus maximus, are paralyzed, then the difficulties are greatly increased. If the gluteus maximus is active, then even if the quadriceps femoris is paralyzed, the gluteus will pull the

femur back and frequently fix the knee, but in hip paralysis the disability is often extreme. In rare cases of extreme paralysis back supports are also needed, and even braces and crutches have been found necessary for locomotion.

Where extreme external rotation is present, it can be controlled by the operation of sewing the fascia lata firmly to the posterior edge of the greater trochanter, while the foot is held in firm internal rotation. In the most severe cases it may be desirable to try arthrodesis of the hip, but our experience with it is as yet too limited to enable us to judge as to its advisability.

Limiting the extent of flexion at the hip joint seems essential in the worst cases. As yet I know of no satisfactory solution of the problem, though Dr. Gill and myself are working at it, but I trust a means of so doing, independent of the use of apparatus, will be found. To stabilize the spine, a bone graft inserted in the lower dorsal and lumbar regions will probably be of service.

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## OPERATIVE TREATMENT OF INFANTILE PARALYSIS.

BY R. TUNSTALL TAYLOR, M.D., F.A.C.S., BALTIMORE.

It is generally agreed that only in the third stage, or what has been called the stage of established paralysis or chronic stage of infantile paralysis, is the surgeon justified, by operation, in assisting natural or physiological efforts at repair of the damage to the peripheral muscular apparatus, that has to do with motion or support, or both.

In this stage, with the greatly varying distribution of the effects of the paralytic lesions in the central nervous system, our conception of the problem falls naturally into two headings or classes, viz: the partially and the totally paralyzed parts or members. Recently, in a valuable article, Lovett has shown that total paralysis is much less common than supposed, and there is some life left in a portion of a muscle or muscles to all intents and purposes apparently powerless, and all of us have seen cases presenting absolutely no power of demonstrable motion, and yet the foot was held, for example, in extreme talipes equino-varus, which, of necessity, means that there is contractility in the medial and posterior groups of muscles somewhere.

But for practical surgical purposes, we may include these in the totally paralyzed, when power is not demonstrable, and cannot be converted into a functioning force if applied elsewhere than in its present location, where it produces deformity.

With these apparent exceptions noted in the totally paralyzed, so the term "partially paralyzed" has gradations, from the slightest impairment of a single muscle to the serious involvement or entire loss of power of several groups, but with demonstrable functioning power in the antagonistic groups. To the writer this gross classification is essential in studying which group a given case falls into, before the surgical procedure best suited is to be thought of.

This sounds very elementary, but are not most of us liable to do our "pet operation" too frequently? Does not a talipes calcaneus to some resemble the "coon" in the slang phrase, "All coons look alike to me," and call for instant Astragalectomy or Arthrodesis or Bone Graft or Tenodesis or "Transverse Horizontal Section" or Silk Ligaments or Tendon Transference, totally regardless of the *status quo*, but dependent on the *ipse dixit* and habit spasm of the Professor?

It must be granted that one method in one surgeon's operating room yields results, while in another's it does not, but when all the conditions of a given case are studied, does this one method give the *best* results obtainable?

In other words, can we standardize operative procedures for a given paralytic deformity? Manifestly not, because so many dissimilar conditions may bring about the same deformity.

On what, then, can we agree? There is no question that three groups of cases present themselves to us with paralysis of the lower extremities:

(a) Those that have deformities from the demonstrable over-activity of certain groups of muscles, with deficient or entire paralysis of the antagonistic groups; in which we can reasonably hope entirely to correct the deformity, equalize the weight-bearing and balance of power of the member and restore functioning motion probably to an extent weaker than normal, but still in directions hitherto absent or scarcely demonstrable prior to operation.

(b) Those that have deformities due to post-paralytic contracture of certain muscles whose power of contractility is not demonstrable, and in which we can correct only the deformity and restore the distribution of the superincumbent weight in a physiological direction, but have no reasonable hope of even partial restoration of function.

(c) The flail extremities, in which there is no distortion to correct, but in which there is a total absence of power and lack of support, which must be supplied by some brace or osteoplastic procedure or silk or tissue tenodeses.

For the sake of discussion and to express his personal views of their value, the writer will take up *seriatim* the various procedures, which have been suggested for the relief of paralytic deformities.

1. **TENOTOMY.** Justifiable if a tendon transplantation or transference cannot be done, which will restore the loss of balance of power, and if a brace is worn for a sufficient period to prevent re-contraction, plus massage, stretching and muscle training of the antagonistic group or groups faithfully employed.

2. Of **MYOTOMY** the same may be said.

3. **TENDON SHORTENING**, by taking a tuck in it by suture, tying or removal of a section, has been tried and found wanting. Unless the peripheral end is cut off the desired amount and then anchored in a periosteal or bone groove, it fails in attaining the desired object.

4. **TENDON LENGTHENING**, by oblique section and suturing, is making the simple operation of Tenotomy into more of an operation, without any commensurate gain.

5. **TENODESIS**, as advocated by Hoffa, Tilanus, Sangiorgi, Reiner and Gallie, in which a tendon adjacent to a joint is converted into a ligament is justifiable only when the parent muscle has so far undergone fatty and fibrous degeneration that no possible functional use can be hoped for from it, if its tendon is transplanted to some other ataxic region.

6. **EXTRA-ARTICULAR AND INTRA-ARTICULAR SILK LIGAMENTS** are chiefly indicated in flail joints where impotent tendons are not to be had for tenodesis. Also as a simpler operation than a tendon transference, they may be employed to correct a distortion in the hope that the over-stretched muscles may regain tone by this adjuvant. As a permanent correction of a deformity of the foot in a small child, they are inadequate during growth, both in supporting increased weight and from pulling out or stretching from their attachment in the periosteum or bone.

7. **ARTHRODESIS** is not to be recommended except for flail ankle joints in adolescents and adults. Taking it all in all, especially the difficulty in securing ankylosis after operation, and the fatigue these cases have on rough ground after this operation, tenodesis or extra-articular silk ligaments are to be preferred.

8. **ARTICULAR TRANSPOSITION FOR CALCANEUS**, as advocated by Gwilym Davis in his Transverse Horizontal Section below the Calcaneo-Astragaloid Articulation destroys no joint, throws the weight forward on the os calcis and corrects the deformity without mutilation, but with no increase in power of extension of the foot on the leg unless accompanied by appropriate tendon transplantations into the heel.

9. **ASTRAGALECTOMY FOR CALCANEUS** is a mutilating operation. It destroys three joints, shortens an already short limb and is not justified, unless other procedures fail to give as stable results in correction and better function.

10. Marked distortions in the long bones, such as knock-knees and bow legs must be corrected, especially often the former, before TENDON TRANSFERENCE is done, with the idea of increasing function and improving static postures.

Removal of portions of small bones of the foot in paralyzed children is unnecessary and may dwarf development; in them the distortion of the foot will undergo physiological bone transformation according to Wolff's Law, when the static balance is equalized by appropriate tendon transference. In adults cuneiform resections are necessary in extreme paralytic deformities, not only as time-savers for the physiological bone transformation but actually to get correction. However, this procedure is to be employed only when used together with Tendon Transplantation.

11. "NERVE ANASTOMOSIS" and "THE NEUROTIZATION OF MUSCLES" are procedures which many of us have tried, but are all still in the position of the well-known gentleman from Missouri, who cries longingly, "Show me!"—as we have not seen anything really practical yet from them.

12. Finally, our sheet anchor in the majority of partially paralyzed cases is to be found in TENDON TRANSPLANTATION, if the case is scientifically studied, and certain fundamental principles, which have been advanced by numerous surgeons with ever-increasing experience and improvements in the technique, are carried out.

Many of these have been brought to the attention of the profession and emphasized by the writer in previous papers, but may be summarized as follows:

Tendon sutured to tendon is no longer considered as efficacious as tendon sutured to periosteum or bone, preferably at the insertion of the paralyzed tendon it is to replace. A muscle, to be transplanted and to functionate most successfully, must have its tendon pull in as straight a line as possible from its origin to its new insertion.

No silk extension is comparable in results to planning and effecting an operative procedure so that there is ample tendon to reach to the new insertion.

Adhesions in the transplanted tendon are to be avoided by carrying it through subcutaneous adipose tissue, through the sheaths of tendons that are to be replaced, or through septa in which non-closable foramina have been made by plastic flaps and by early electrical stimulation to prevent adhesions from forming. Several small skin incisions are preferable to two large ones. Subcuticular silver stitches are less likely to lead to adhesions.



Correction of deformity should be secured by having sufficient tension on the transplanted tendon to hold the part in over-correction and, at the same time, not such brutal tension as to cause tendinous degeneration.

Slack should always be taken up by good tension on the transplanted tendon, and by passing it either through the sheath of the tendon it is to replace or through a thecal compartment under the annular ligament at the ankle.

#### AUTHOR'S "FOUR-INCISION" TENDON TRANSPLANTATION

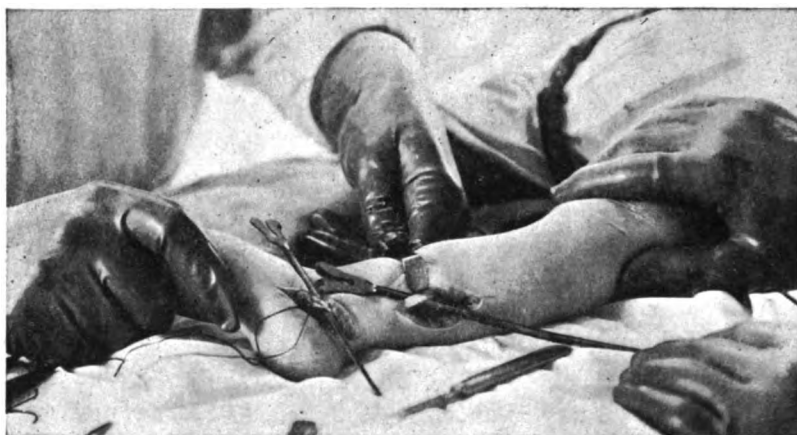


FIG. 1.—*a*. Exposing tendon near insertion. *b*. Incision over hyper-active muscular portion of same.



FIG. 2.—Tendon withdrawn from sheath in incision 2.

## AUTHOR'S "FOUR-INCISION" TENDON TRANSPLANTATION

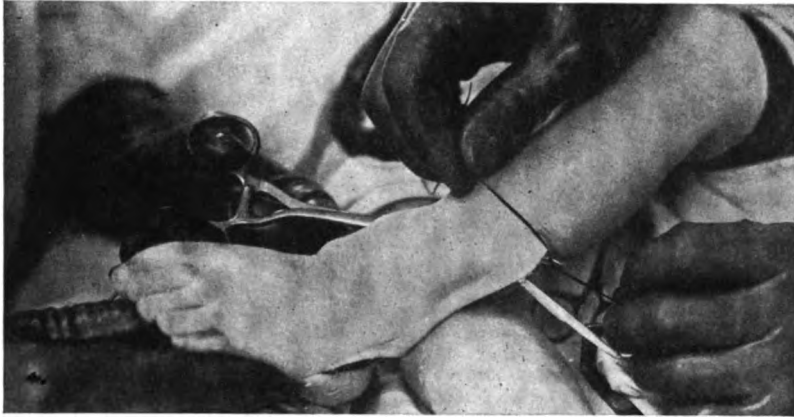


FIG. 3.—Drawing the tendon through the adipose tissue to the sheath of the Tibialis Anticus.



FIG. 4.—The tendon having been passed under the Annular Ligament and through its new sheath in incision 3, is sutured to the bone at the insertion of the Tibialis Anticus in incision 4.

To expect an Extensor Longus Hallucis to balance the combined pull of three normal Peronei in Valgus is as unscientific as to use half of the tendo Achillis to correct a Talipes Varus when transplanted on the outer side of the foot.

The question of time when weight-bearing is to be permitted, depends on the severity of the original deformity, the strength of the transplanted tendon and the security of the mechanical fixation by sutures,

the possibility of early muscle training in active exercises, electricity, massage, etc., and should not be sooner than thirty days, and then with a proper supporting shoe or cast for the after-treatment to maintain correction, in order that any distorted bones may undergo physiological transformation, according to Wolff's Law.

Fine intestinal silk is preferable to catgut, kangaroo tendon, or heavy or paraffin-coated silk, in suturing the tendon accurately to the periosteum in the bone groove.

With these methods, as the technique improves, we are certainly securing more function and discarding more braces each year.

2000 Maryland Avenue.

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### THE OPERATIVE TREATMENT FOR THE DISABILITIES AND DEFORMITIES FOLLOWING ANTERIOR POLIOMYELITIS, AS PRACTISED AT THE HOSPITAL FOR RUPTURED AND CRIPPLED DURING THE PAST THREE YEARS.

BY CHARLTON WALLACE, M.D., NEW YORK.

IN studying the operations for the deformities and disabilities following anterior poliomyelitis at the Hospital for Ruptured and Crippled during the past three years, an attempt has been made to classify them, and they have been divided into eleven groups, and these have been subdivided into three classes, according to the last observation. The operations that gave the best possible result obtainable have been placed in the "successful" column, those that were much improved but not entirely satisfactory have been placed in the "improved" list, and the ones that did not terminate as desired are included in the "failed." Every endeavor has been made to have the patients revisit the hospital for final notes, but many had moved from the addresses given, and it was impossible to locate them, hence most of the last information has been taken from the house histories. In Group XII the follow-up findings have been recorded, but these are all included in the preceding eleven groups.

The average age of the patients at the time of acute attack was two years and one month, and the lapse of time between the onset and the date of operation was five years and nine months.

The superior and contemporary surgeons of the author have made possible this article, and to them are extended my most sincere thanks.

## GROUP I.

## OPERATIONS PREPARATORY TO THE APPLICATION OF BRACES OR OPEN OPERATION.

	Successful.	Failed.	Total.
Stretchings under anesthesia for flexion at hip, knee or foot.....	20	0	20
Tenotomies, fasciotomies, with stretchings for foot deformities .....	94	10	104
Tenotomies and stretchings for multiple flexion deformities of lower extremities.....	35	3	38
Tenotomies for contractures of tensor fasciæ femoris	15	1	16
Soutter operation for contracture of tensor fasciæ femoris .....	6	0	6
Tenotomy of biceps for flexion deformity at knee....	1	0	1
Forcible manipulation of foot, preliminary to open operation .....	25	0	25
<b>Total .....</b>	<b>196</b>	<b>14</b>	<b>210</b>

Comparing the tenotomies of the tensor fascia femoris with the Soutter operations for flexion deformity at the hip, it seems as if the latter is preferable and more efficient, although only a few of these have been done.

## GROUP II.

## MISCELLANEOUS OPERATIONS FOR PARALYTIC FOOT DEFORMITIES.

A.	Successful.	Improved.	Failed.	Total.
For varus—tibialis posticus and anticus and flex. long. dig. sutured to fifth metatarsal.....	1	0	0	1
For varus—peroneals grooved in fibula and ext. prop. hal. transplanted to calcaneo-cuboid ligament....	1	0	0	1
For varus—peroneals grooved into fibula and tib. ant. transplanted to calcaneo-cuboid ligament.....	0	0	1	1
For dangle knee and foot—silk sutures through joints	0	0	1	1
For dangle foot—bone insertion between head of astragalus and scaphoid arthro.....	0	0	1	1
For equinus—bone insertion, fib. and astrag.....	1	0	0	1
For equino-cavus—tenotomy of tendo Achillis ext. com. dig. to scaphoid and tibialis anticus tendon	0	0	1	1
For calcaneo-valgus—astragalectomy and peroneals into tissue over scaphoid.....	0	0	1	1
For cavus—tenotomy tendo Achillis ext. com. dig. to scaphoid .....	0	0	1	1
For hyper-extension, little toe—tenotomy tendon ext. to toe .....	1	0	0	1
<b>Totals .....</b>	<b>4</b>	<b>0</b>	<b>6</b>	<b>10</b>
<b>B. For Equino-Varus.</b>				
Extensor communis dig. trans. into scaphoid.....	1	0	0	1
Tibialis anticus transplanted into head of astragalus	1	0	0	1
Head of astrag. resected, tib. ant. split and part trans. into ext. malleolus.....	1	0	0	1
Tendo Achillis grooved post. s. tib. and ant. to anterior surface and peroneals to fibula.....	1	0	0	1
<b>Totals .....</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

<i>C. For Equino-valgus.</i>				
	Success- ful.	Improved.	Failed.	Total.
Tib. post. and flex. long. hal. trans. ant. tib. and ext. long. hal. to base of first metatarsal.....	1	0	0	1
Tib. post. trans. to tib. ant., ext. prop. hal. to calc. scaphoid ligament.....	0	1	0	1
Davis and fasciotomy.....	1	0	0	1
Tenotomy tendo Achillis—tib. post. and ant. grooved tibia and ex. prop. hal. transplanted to first metatarsal .....	1	0	0	1
Ext. prop. hal. sutured through scaphoid and cuneiform .....	1	0	0	1
Ext. prop. hal. sutured into scaphoid.....	0	0	1	1
Totals .....	4	1	1	6
<i>D. For Valgus Deformities.</i>				
Tib. ant. and post. grooved to tibia.....	0	1	0	1
Tib. post. grooved to tibia and ext. prop. hal. to calcaneo-scaphoid ligament.....	0	0	1	1
Ext. prop. hal. grooved through scaphoid.....	1	1	0	2
Per. longus and ext. prop. hal. trans. to scaphoid and first cuneiform.....	1	0	0	1
Tibialis posticus and ext. prop. hal. trans. to tibialis anticus .....	1	0	0	1
Per. longus transplanted to internal surface of scaphoid and first cuneiform.....	1	0	0	1
Totals .....	4	2	1	7
<i>E. Tib. Ant. Trans. to External Border Foot.</i>				
For equino-varus.....	3	0	0	3
Totals .....	3	0	0	3
<i>F. Tib. Ant. Transplanted to Cuboid and Peroneals Grooved to Fibula.</i>				
For equino valgus.....	1	0	0	1
For varus.....	1	0	0	1
For equino varus.....	1	0	0	1
Totals .....	3	0	0	3
<i>G. Open Shortening Tendo Achillis.</i>				
For calcaneus.....	0	0	2	2
Totals .....	0	0	2	2
<i>H. Tendo Achillis Grooved Posterior Surface of Tibia.</i>				
For calcaneo-valgus.....	1	1	0	2
For calcaneus.....	2	0	0	2
Totals .....	3	1	0	4
<i>I. Tendo Achillis and Tib. Post. Grooved to Posterior Surface of Tibia.</i>				
For calcaneo-valgus.....	1	0	0	1
Tib. Ant. Grooved into Ant. Surface of Tibia.				
For valgus.....	1	0	1	2
For equino valgus.....	0	1	0	1
For equino varus.....	0	1	0	1
Totals .....	2	2	1	5

*J. Osteotomy of Femur.*

	Success- ful.	Improved.	Failed.	Total.
For knock-knee deformity.....	1	0	0	1
Totals .....	1	0	0	1

*K. Transplantation of Trapezius.*

For shoulder paralysis.....	0	0	1	1
Totals .....	0	0	1	1
Final totals.....	28	6	12	46

When the active tendons have been transplanted into the bone or periosteum, they have grown well to their new attachments, but not enough have been done to warrant recommending muscle transference for foot conditions. The futility of attempting to reef a paralyzed tendo-Achillis tendon upon itself for calcaneus was demonstrated.

## GROUP III.

	Success- ful.	Failed.	Total.
Arthrodeses for subluxation at the hip.....	1	4	5
Transplantation of biceps to insertion of quad. ex. ten. for quadriceps paralysis. (Power of extension 13, holdings 5).....	18	0	18
Transplantation of semi-membranosus. (Power of exten- sion 9, holding 2).....	11	0	11
Totals .....	30	4	34

The attempt to secure ankylosis of the hip in children, by doing an arthrodesis, has been almost useless.

When there was paralysis of the quadriceps extensor muscle and both hamstrings were present and active, the substitution of the one or the other for the paralyzed muscle has given satisfactory results. All of these transplantations held firmly, and power of voluntary extension of the leg was manifested in 22 cases, and 7 were able to walk without any recurvatum. Proper locomotion was secured when braces were omitted.

## GROUP IV.

*A. Arthrodesis Peri Astragalus.*

For equino varus .....	7
" varus .....	4
" dangle foot .....	4
" valgus .....	4
" equino valgus .....	3
" equinus .....	2
" calcaneo valgus .....	2
" calcaneus with shortening tendo Achillis....	3
Total .....	29

<i>Results.</i>		Success- ful.	Improved.	Failed.	Total.
Holding firmly.....	13				
Improved but not firm.....	6				
No ankylosis.....	10				
<b>Total .....</b>	<b>29</b>				
		13	6	10	29
<b>B. Resection, Bony Wedge, Outer Border of foot Through Cuboid, Os Calcis, and Astrag.</b>					
For some type of varus deformity.....	18		2	5	25
<b>C. Resection, Bony Wedge, Inner Border of Foot.</b>					
For valgus deformity.....	7		0	2	9
<b>Totals .....</b>	<b>38</b>	<b>8</b>	<b>17</b>	<b>63</b>	

Six of the arthrodeses cases were on the border edge of failure and probably should be classed as such, although the attitude of the feet was benefited. There was no evidence of ankylosis in 10, but 13 gave promise of it.

The resection of a bony wedge from one or the other border of the foot is probably commendable, because the weight-bearing ability was improved.

#### GROUP V.

##### A. Ant. Tib. to Groove Ant. Surface of Tibia, Ext. Prop. Hal. Transplanted to Calcaneo Schaphoid Ligament.

	Success- ful.	Improved.	Failed.	Total.
For equino valgus.....	26	3	1	30
For valgus.....	5	0	0	5
<b>B. Peroneals Grooved Into Fibula (Galle).</b>				
For equino varus.....	7	0	3	10
For varus.....	2	0	0	2
<b>Totals .....</b>	<b>40</b>	<b>3</b>	<b>4</b>	<b>47</b>

The grooving of the paralyzed anterior tibial tendon into the front surface of the tibia, combined with the transplantation of a strong extensor proprius hallucis tendon through the calcaneo-scapoid ligament, looped back and sutured to itself, has given acceptable results. The post-operative treatment has been the temporary application of the Whitman brace, with a slight lift along the inner border of the shoe.

#### GROUP VI.

##### Astragalectomy—Peroneals Through Groove of Fibula —Backward Displacement of the Foot.

	Success- ful.	Improved.	Failed.	Total.
For equino varus.....	11	2	0	13
" varus .....	6	1	1	8
" dangle foot.....	5	1	0	6
" calcaneus .....	1	0	0	1
<b>Totals .....</b>	<b>23</b>	<b>4</b>	<b>1</b>	<b>28</b>

## GROUP VII.

*A. Astragalectomy—No Cutting Peroneals. Backward Displacement of the Foot.*

	Success- ful.	Improved.	Failed.	Total.
For dangle foot.....	22	3	5	30
" equino valgus.....	10	2	1	13
" equino varus.....	10	2	1	13
" calcaneo valgus.....	6	1	2	9
" valgus .....	6	1	0	7
" varus .....	3	2	0	5
" calcaneus .....	3	0	2	5
" equinus .....	1	0	0	1
Totals .....	61	11	11	83

*B. Astragalectomy—Peroneals Cut—Not Sutured. Backward Displacement of the Foot.*

For dangle foot.....	1	0	0	1
" equino varus.....	0	1	0	1
" equino valgus.....	1	0	0	1
" calcaneus .....	1	0	0	1
Totals .....	3	1	0	4
Final totals.....	64	12	11	87

## GROUP VIII.

*A. Astragalectomy with Peroneals Sutured to Themselves. Backward Displacement of Foot.*

For equino varus.....	2	0	0	2
" varus .....	1	0	0	1
Totals .....	3	0	0	3

*B. Astragalectomy—Peroneals Sutured to External Border of Os Calcis. Backward Displacement of Foot.*

For calcaneo valgus.....	2	0	0	2
" dangle foot .....	1	0	0	1
Totals .....	3	0	0	3
Final totals .....	6	0	0	6

In Groups VI, VII and VIII where astragalectomies have been performed and the peroneal tendons have been utilized by grooving them through the outer surface of the fibula (Gallie); or not interfering with them at all; or cutting and resuturing the peroneals to the outer surface of the os calcis or again to themselves, there have been obtained good feet. This is especially so for varus or equino varus deformity, when the foot has been displaced well backward.



## GROUP IX.

<i>Whitman Operation.</i>		Success- ful.	Improved.	Failed.	Total.
For calcaneo-valgus .....	64	4	2	70	
“ calcaneus .....	13	2	1	16	
“ dangle foot .....	10	3	1	14	
“ varus .....	4	1	0	5	
“ valgus .....	4	0	1	5	
“ equino-valgus .....	1	0	2	3	
“ calcaneo-varus .....	0	0	1	1	
“ calcaneo-cavus .....	0	1	0	1	
“ equino-varus .....	1	0	0	1	
Totals .....	97	11	8	116	

The typical Whitman operation has given a good functioning member when performed for calcaneo valgus, calcaneus and dangle foot conditions, and warrants the confidence placed in it.

## GROUP X.

<i>Stretching—Post-Operative.</i>		Success- ful.	Improved.	Failed.	Total.
For varus—post astrag., no cutting of peroneals.....	1	4	0	5	
“ varus—post arthrodesis .....	2	0	1	3	
“ varus—post osteotomy—ex. border.....	1	0	1	2	
“ varus—post Gallie.....	1	1	0	2	
“ varus—post tendo Achillis.....	1	1	0	2	
“ equino-varus—post arthrodesis peri astragalus..	1	0	0	1	
“ equino-varus—post Whitman.....	0	0	1	1	
“ equinus—post whitman .....	1	0	0	1	
Totals .....	8	6	3	17	

These forcible manipulations under anesthesia were made necessary on account of the faulty attitude which existed at the removal of the first dressing or subsequently.

## GROUP XI.

	Success- ful.	Improved.	Failed.	Total.
<i>Operations—Post Whitman or Astragalectomy for Faulty Attitude.</i>				
For varus—post astrag.—open operation.....	2	0	0	2
For varus—post astrag.—trans. tib. ant. and per. to ex. border of foot.....	2	0	0	2
For varus—post astrag.—tib. post. to tendo Achillis..	1	0	0	1
For varus—post Whitman—tib. post. to tendo Achillis and tib. ant. to external border of foot.....	2	0	0	2
For varus—post Whitman—tib. post. through tendo Achillis, sutured to peroneals and periosteum....	0	1	0	1
For varus—post Whitman—fibula freed. Foot displaced backward.....	1	0	1	2
For drop at tarsal—post. astrag. tib. post. to dorsal scaphoid .....	1	0	0	1
For drop at tarsal—post. astrag.—ex. com. dig. and ext. prop. hal. to groove in ant. surface tibia....	1	0	0	1
Totals .....	10	1	1	12

These operations were done to remedy a foot which had assumed an undesirable position following a Whitman or astragalectomy operation.

## GRAND TOTAL.

	Successful.	Improved.	Failed.	Total.
Group I.....	196	0	14	210
" II.....	28	6	12	46
" III.....	30	0	4	34
" I.....	38	8	17	63
" V.....	40	3	4	47
" V.....	23	4	1	28
" VII.....	64	12	11	87
" VIII.....	6	0	0	6
" IX.....	97	11	8	116
" X.....	8	6	3	17
" XI.....	10	1	1	12
Totals .....	540	51	75	666

## THE SEQUELAE IMMEDIATELY FOLLOWING OPERATIONS.

Nine Whitmans, three astragalectomies, one arthrodesis with bone graft, one biceps transplantation, one anterior tibial muscle grooved into front of tibia, healed by secondary intention without influencing the final result.

There were ten wound infections, of which five were Whitmans, two preceded by iodine dermatitis, two astragalectomies, one biceps transplantation, one Soutter, one tibialis posticus grooved into tibia, but the purpose of the operation was not affected.

One linen suture extruded at biceps transplantation to quadriceps extensor, and one silk suture came out at the peroneal insertion on the outer border of the foot.

One patient suffered amputation at the lower third of thigh, due to gangrene following venous embolism after open tenotomies of the hamstrings and subcutaneous tenotomy of the tendo Achillis and severe manual manipulation. Another had the foot taken off on account of gangrene, caused by bandage constriction and inadequate suspension of the foot after a Whitman operation.

## GROUP XII.

	Success- ful.	Improved.	Failed.	Total.
Tenotomies and stretchings for multiple flexion deformities of lower extremities.....	10	0	0	10
Tenotomies for contractures of tensor fasciæ femoris	3	0	1	4
Tenotomies and fasciotomies of the tendo Achillis....	28	1	2	31
Miscellaneous tendon transplantation about the foot	12	3	6	21
Transplantation of the hamstrings for quadriceps paralysis .....	14	1	0	15
Arthrodeses for subluxation at the hip.....	0	0	1	1
Arthrodeses peri astragalus.....	1	0	4	5
Osteotomy—outer border of the foot.....	8	0	1	9
Osteotomy—inner border of the foot.....	0	1	0	1
Grooving of tibialis anticus and trans. of ex. prop. hal. into calcaneo scaphoid lig.....	23	0	1	24

	Success- ful.	Improved.	Failed.	Total.
Peroneals grooved into fibula (Galle).....	5	0	4	9
Astragalectomy—peroneals grooved into fibula—back- ward displacement of the foot.....	7	0	1	8
Astragalectomy—peroneals cut—not sutured. Back- ward displacement of the foot.....	0	1	0	1
Astragalectomy—no cutting peroneals—backward dis- placement of the foot.....	27	2	2	31
Whitman operation .....	36	3	2	41
Foot stretchings—post-operative.....	8	0	1	9
Open operations—post Whitman or astrag.....	7	0	0	7
Totals .....	189	12	26	227

## CONCLUSIONS.

1. Nearly one-third of the operations in the foregoing tables would have been unnecessary if the patients had received proper brace attention.
2. The Soutter operations for contractures about the hip have been most beneficial.
3. The transplantation of an active hamstring tendon, when both were normal, to the attachment of the paralyzed quadriceps extensor tendon, has so improved the power about the knee that braces have been discarded.
4. Arthrodeses operations for paralytic deformities in children have been of little value.
5. The grooving of the tibialis anticus tendon into the anterior surface of the tibia, and transplanting the extensor proprius hallucis tendon to the calcaneo scaphoid ligament, for equino valgus deformity, has been helpful.
6. The most satisfactory operation for calcaneus, calcaneo valgus and dangle foot deformity, has been the typical Whitman. The backward displacement of the foot accompanied with astragalectomy are the essential features of this operation, and they have been utilized to great advantage in all types of paralytic foot deformities. When successful a firm basis for standing and walking has been secured, and after a few months of supervision, the patients have been able to walk without artificial aid, thus probably stimulating the growth of the paralyzed extremity. The improved circulation so increased the warmth of the feet that the tendency to chilblains was lessened.

## DISCUSSION.

*Papers on Infantile Paralysis* by Drs. Rogers, Ryerson, Davis, Taylor and Wallace.

DR. WILSON. I deeply regret that Dr. Flexner is not to be here so as to emphasize the hiatus that exists between epidemic infantile paralysis and the correction of deformities resulting from this infection. Immense possibilities

for treatment of the paralytic are present at that time, but the patient is often left for treatment, by excessive massage and stimulation, in the hands of those least qualified to give it. I think that those cases treated by the Lange method, which followed Oppenheim's method, of placing the spine in plaster of Paris have been the most tractable and have later presented fewest deformities. Dr. Rogers emphasized the importance of postponing operation in a child. There should be a rational establishment of physiological function. Those of us familiar with Dr. Lovett's work on physiological function will feel that this is very important and that often operative procedure may be omitted. The Association should decide whether operation should be early or late in these cases. I have personally frequently seen cases that appeared to demand operation, which have been subjected to physical culture in a careful methodical way, and have had the deformity removed so that operation was not necessary. I think Dr. Rogers should have suggested something to occupy the time after the occurrence of paralysis. That is the most important part of the whole period.

DR. TAYLOR. I think that this symposium has been one of the most interesting and important ones that we have ever had. The material constitutes a very large part of the work of orthopedic practice. My major premise is that deformity should nearly always be prevented. This cannot always be done, but nearly always. The deformities of the lower extremities can usually be prevented by physiological treatment of the muscles, by mechanical stretching and by brace treatment. By simple means about half of the material brought to the orthopedic surgeon can be absolutely saved from operative interference. The next point I wish to emphasize is that young children should not be subjected to major operations. Probably the best work that I do is to fend off early operations in young children. Young surgeons often urge a major operation for a young child. I always advise postponement until the child is half grown at least. In regard to the simplicity of operations, I think cases should be carefully studied before deciding upon a procedure. With young patients the plan should be as simple as possible. It is better to do two or three operations and watch the effect than to combine too many procedures at once.

DR. PAINTER. In selecting readers of papers on this subject I have endeavored to get the younger men so that the older men might discuss the papers, and perhaps give a more mature point of view.

DR. RIDLON. I don't know whether the President feels that my point of view is mature enough. I think all of these papers have been excellent. One thing impressed me and that is the fact that, if our report goes to the public without a word of protest, the public may be justified in feeling that the orthopedic men have become general surgeons. All that has been said to-day as to what should be done, has been as to what should be done by operation. That is not all of it; it is not the major part of it. As a general proposition I may state that in every case where deformity can be prevented, it should be prevented without operation, and secondly, where deformity has developed, if it can be corrected without operation it should be. I have a strong conviction that cases can be corrected without operation, and I believe that this line of treatment will give better functional results than treatment by operation. As to what

cases should be operated on and who should have braces, that depends on the man who is treating the case. Some men can operate beautifully, some cannot (I am one); some can treat cases efficiently with braces and some cannot. The man who cannot operate efficiently had better leave it alone. The man who cannot treat a case well with the brace should not try to do it. Cases of infantile paralysis, where there is involvement of the knee, a great many members believe should be operated upon. In my opinion, however, I have seen no cases of knee involvement that I considered needed operation at any time. All of these cases should have correction without operation. I have done some tenotomies but I believe that we should cut out a great deal of operative work. The conclusions arrived at by Dr. Rogers in his paper are those which I can most cordially and entirely endorse.

DR. WHITMAN. I shall confine my remarks to operations entirely. Fifteen years ago I called the attention of the Association to this operation which was originally designed for paralysis of the calf muscle accompanied by calcaneus and lateral deformities. All of these later operations have developed as a side issue. I am surprised to think now that I do more operations for the outside conditions than for the original one. In New York, however, nearly all of the cases of calcaneus deformities have already been treated; it is difficult to find one that has not. There is one exception in the treatment of calcaneus as regards early interference. The one muscle that is paralyzed is larger than all the other leg muscles combined. I have seen patients treated conservatively and the deformity and atrophy of the foot and limb increase in spite of the conservative treatment, and if one can provide a very resistant foot by removal of the astragalus, which is not provided by any kind of brace, the operation should be done at an early age, say 3 to 5 years. I have never regretted having done this. It is the one exception in early operative interference.

DR. ALLISON. Dr. Rogers in his paper has brought out so clearly for our consideration the difference between the treatment of adults and children who are afflicted with poliomyelitis paralysis that his statements need no further emphasis from me. Dr. Ryerson has spoken of the use of silk ligaments, and I agree with him in what he has said. In our experiences we have found that a certain small percentage of the cases where silk ligaments have been employed show stretching or tearing of the silk ligaments, with return of deformity after the foot has been put into functional use. We do feel, though, that there is a place for the suspension operation using the silk ligaments, and this place is in the cases where the dorsal flexors are relaxed but still have some power; then the simple operation of suspending the foot at right angles will give this weakened muscle a chance to regain functional power. Dr. Davis has spoken of feeling that there is considerable doubt as to the value of the transplantation of the hamstrings or the sartorius where the quadriceps is paralyzed. I think Dr. Wallace has answered the question that is raised. In our own experiences we have found this type of transplantation at the knee to be a most useful surgical procedure, giving both power and stability; the two things that we are looking for. The operation that we have found of most use in flail ankles or calcaneo-valgus has been the Whitman operation, and we have had the best functional results from this operation. Some one in discussing these papers has suggested

that the papers read do not cover the treatment of poliomyelitis. All of us, I am sure, are agreed that this group of papers speaks only of the operative treatment of poliomyelitis, and I think also that it is quite clear in all of our minds that our patient should be properly cared for both with treatment and braces both before and after operation.

DR. LOVETT. I think that this is one of the most interesting discussions that we have ever had. A series of discussions like this would bring us together and would standardize the operative end of our work. In regard to operative procedures in children, our early operations were too elaborate and the results have not been as good as they should have been. The end-results of cases operated on now would be better. The simpler the technique, the better the result in children. However "operative" a man may be, he is not going to do operations until at least two years after the onset of the infantile paralysis. What shall be done in these two years? We have these two years during which time the patient is going to be badly or well treated. During the last year, I have been working with the spring balance muscle test and have formed certain conclusions which are pretty definite in regard to the care of the muscles. Few things are of greater importance, and spontaneous improvement goes on longer than we have any idea of, it goes on for one or two years. I think that we allow our patients to do too much. This winter I have restricted my patients very much, much more than before, with good results, as shown by figures on the muscle test. Another important point is that among the most satisfactory cases that I have observed have been cases five or six years after onset, showing that cases are amenable to treatment and to muscle development very much longer than we suspect. In cases of gastrocnemius paralysis, I have put the patient on high heels, and forbidden them to walk on the ground. This was suggested by Dr. Gibney's plan to put them in plantar flexion and in almost all cases treated in this way I have seen considerable progress. The restriction of use is a very important thing, and I would lay great stress on the avoidance of fatigue. My patients have done better with restricted amount of exercise. These weak muscles are often overworked.

DR. BRACKETT. I think that no more important emphasis could have been made than that of the endorsement of postponing operative interference in these cases to a late period, even to young adult life if possible, with two exceptions only: (1) The non-destructive operations of tenotomy and of fixation by use of the paralyzed tendons, and (2) When the increase of the deformity cannot be controlled, owing to a very marked antagonized muscle pull combined in bad static positions. Cases operated upon at an early age show a very great tendency to relapse, and the relapsed deformity is usually more severe and difficult to correct than the original distortion. Late interference gives the greatest surety of permanency to the benefit of the operation, by choosing a time when the bones are near to their permanent resistance, and the position obtained will not be affected by several years of growth during a plastic period. It also has the very marked advantage of giving opportunity for the development of all potential power of the affected muscles, so that the operation may be more wisely planned as to the ultimate power of the limb. The long period during which it is possible to work, is one of the encouraging features of these cases,

for one can frequently see regaining power, even several years after the onset of the paralysis.

**DR. FREIBERG.** I had not intended taking part in this discussion, but I have had to listen to very different viewpoints and have been trying to correlate them. I am rather surprised to find that there is so much divergence of opinion and that our ideas are so little concurrent. It is obvious that the Whitman operation holds the important place it deserves in calcaneus deformities or in dangle-foot; it does all that it is offered as doing, perhaps more. I have been enthusiastic over the question of management of paralytic cases, but there are some points that may be emphasized. Dr. Lovett has taken the ground that I should feel like taking, and that is, that cases which seem to give such good results following tendon transplantation, and show recovered function, even the most selected of these cases, after one or two years frequently show weakness and deformity again. These patients have been allowed to do more than they should. They should be protected by mechanical means. The simplest kind of transplantation is the one that gives the most favorable results. Patients can often be protected by wearing the proper kind of shoe without any brace whatever. Frequently at the end of 6 months the patients will have acquired strength in the transplanted muscle. Later, however, in some cases in which I have been most anxious to secure good results, I find they have developed a distinct valgus, although using a wedge shoe. I think that here there is the same kind of problem as in the unparalyzed child who develops valgus feet. It calls for an additional amount of mechanical and functional protection, and activity must be carefully restricted.

**DR. PORTER.** I should like to add another word of caution as to conservatism to what Dr. Ridlon has said about not operating on any but a very few cases and on the use of braces, and on what Dr. Rogers has said about extreme caution, and also on Dr. Lovett's remark that two years after paralysis was not long enough to wait. We were very much impressed by Dr. Wallace's paper, and by the constant repetition of one word, that was "failure," and I am convinced that a large percentage of failures have been due to the poor judgment and lack of study of the case before operation was performed. There are either too many operations or too elaborate procedures carried out at one sitting. The operator sometimes transplants one poor, weak muscle to take the place of several strong muscles. I believe it is extremely foolish to try to transplant a weak muscle like the extensor proprius hallucis to take the place of the tibialis. Many cases that look as if they had complete paralysis will prove to have some power upon careful examination. If you divide the tendo Achillis and put the foot in hyperextension 4 to 6 months as in the Gallie operations, the tendon will contract, if the patient has not complete paralysis of the extensors. I want to accentuate what Dr. Taylor has said about doing operations for the lengthening of the tendons, and splitting tendons. The man who splits tendons and sews them up again does not know how to do subcutaneous tenotomy.

**DR. SILVER.** Dr. Ryerson spoke, I believe, of hoping to find a method which will give permanent results in children. This seems to me an obvious impossibility, since we cannot hope to restore balance so perfectly that it will not be dis-

turbed by slight irregularities of growth. Whatever operation is performed, parents must be instructed that continued supervision during the growing period will be necessary.

I wish to call attention to one point which has so far, I believe, not been mentioned: In a number of cases I have noticed after relatively slight operations which act to prevent fatigue, such, for example, as the Gallie operation of tendon fixation, a marked improvement in the circulation of the extremity, and this alone has seemed to me of sufficient value to justify the procedure.

DR. MYERS. I wish to call attention to the correlation of the joints of the foot, knee and hip, and advise that their functions should be studied together when any operation is considered. A good many cases of equinus will not be benefited by operation if there are weak extensors at the knee. The weight-bearing axis in these cases should be kept well forward. The thigh extension power of the gluteals is very important in such cases, but even if the glutei are weak, strong gastrocnemii can pull the femur backward when the foot is on the ground, and so prevent flexion of the knee. I have seen cases with no power in the quadriceps who can walk perfectly well, because the foot is in equinus and there is good power in gastrocnemii.

What Dr. Lovett said appealed to me. I have been urging my patients for years to rest the weak muscles. I have told them one can exhaust any muscle by over-exercise, but if the power of the muscle is reduced this occurs very soon.

In papers on this subject massage and electricity are always mentioned, but in a very casual way, and I think few surgeons have exact enough knowledge of the proper use of the various kinds of massage, manipulation, electricity and muscle education, and that more study of their use and abuse would be of value.

DR. YOUNG. In the preceding discussion nothing has been said of the presence of acetone in the cases selected for operation. It is highly important to ascertain if acetone be present, since many cases cannot have operations performed until they have been successfully treated by the clinician.

In regard to the time for operation, I believe that operation should be done about twelve to fourteen years of age, or before the second growth takes place, so as to dispense with the wearing of apparatus before the child reaches adult life. This will give a longer period than has been suggested by some for conservative treatment, since many children are stricken with the disease between two and five years of age.

The most interesting point in the whole discussion was made by Dr. Wallace, when he said that patients well treated during the earlier stages of the disease would not so frequently require operation. This coincides with my own experience. In regard to the method of operation, it is my opinion better functional results are obtained by tendon transplantation than by arthrodesis. In regard to the method of transplantation of tendons, while in certain locations I favor transplantation, into the periosteum or bone, I have not in selected cases abandoned the earlier method of Nicolodani tendon to tendon transplantation, in some cases supplementing the short tendons by the use of braided silk after the method of Lange. In order to insure success it is absolutely necessary in all cases of tendon transplantation to prohibit the use of the tendon for twelve weeks.



DR. CONE. One point should be considered in connection with delaying operation. I believe in waiting, but don't wait too long. Some nearby groups of muscles recover after transplantation elsewhere. In one case with involvement of the thigh and the anterior muscles of the foot, the foot was not operated on at the time the thigh was operated on. Within a year the foot muscles recovered and did not require operation. New coördinating centers seem to form again in some way. As to how long after paralysis recovery may take place,—I had a case under my supervision 18 years; at two years there was paralysis of the extensor group of the thigh and leg; at the 16th year the patient was able to discard his brace, the thigh muscles recovering power.

DR. WALLACE. The object of my paper was to tell what was being done at the Hospital for Ruptured and Crippled by operative measures. These cases were treated for two or three years by means of braces, massage and careful observation. In this way one would expect gradual improvement, but it is impossible to bring back life to the paralyzed muscles, and therefore, no active developmental exercises are advocated. It is one's belief that patients should be encouraged to use the muscles under the protection of braces, and thereby prevent contractures and over-development of the unaffected muscles. Most of these cases arrive at an age when they wish to throw away all braces, and, therefore, one desires to have them in the best possible condition when such a time is reached. It is evidently our duty, after the patient has had good conservative treatment, to place him in the best attitude possible, and operations are done for that reason. None of the cases included in the report were operated upon, as before said, until three or four years had elapsed after the onset.

DR. TAYLOR (R. T.). In regard to the difference in the treatment of children and adults with anterior poliomyelitis, I have found that in adults you have very much more intelligent coöperation in the after-treatment. Adults will take as much pride in developing a transplanted muscle as a boy will in developing his biceps. They seem obsessed with the desire to move it more and more.

I think Dr. Freiberg said something about transplanting the extensor proprius hallucis to counterbalance the pull of the strong peronei muscles. In spite of all bracing, in our experience, the peronei will win in the end and relapse will occur.

In answer to Dr. Ridlon I would say that we do carry out brace and gymnastic treatment as far as we can in all cases before we consider operation. We resort to operation only if the deformity is increasing in spite of these efforts and if we feel reasonably sure we can restore normal weight-bearing or fair function or both, and be able to discard apparatus.

DR. DAVIS. Vulpius says that three-fourths of a year should be allowed for recovery after paralysis. Dr. Lovett speaks of two years, but I think that even four to six years would not be too long to wait for improvement in the function of the limb. I do not know of any apparatus that will prevent the cavus type of deformity. To make a back-knee by putting the limb up in plaster will often do it, but if it requires too much effort I do an osteotomy to give a slight back-knee. When there is knock-knee in addition, I think

there is nothing else to do. Dr. Allison has spoken of transplantation of the hamstring. That is sometimes successful, but I have transplanted these muscles which I have seen to act, but still there was instability. I regard this operation as uncertain. Dr. Whitman has said it has taken 15 years to arrive at the proper estimation of astragalectomy; I wonder how long it will take to arrive at an appreciation of arthrodesis. Dr. Wallace has said that in New York they consider that arthrodesis is no good. Dr. Dane, years ago, showed that it was. If you do arthrodesis to the subastragaloid joint there must be sufficient traumatism to the joint, otherwise it will be loose. You must dig all the cartilage and bone up, saw-tooth the joint and you get a perfectly stiff joint. Don't remove any chips.

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### THE SPRING BALANCE MUSCLE TEST.

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AND

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A MEANS of estimating the quantitative strength of muscular groups has been devised and has proved of practical use. It was formulated for the purpose of giving not only a qualitative but a quantitative value to the examination.<sup>1, 2, 3</sup> It deals with muscular groups rather than with individual muscles, and is likely to be of assistance, not only in the examination of the individual cases, but also in the study of the phenomena of the disease and possibly in diagnosis. Data obtained by its use have already been published.<sup>4</sup>

That such a quantitative test was necessary became evident at the outset of the work in Vermont, references to which have just been given.

At the beginning of this work, muscles were classed as normal, partly paralyzed or totally paralyzed. The first and the last classes were clear enough, but in the "partly paralyzed" division we had to group muscles which were just short of normal and muscles which showed only a flicker of movement on attempted contraction. Between these two widely separated conditions existed every degree of disability, yet one must put them all in one class. Exact study of the phenomena under these conditions was impossible.

Again, in the matter of treatment some scale of measuring improvement or the reverse was urgently needed. "Impressions" that electricity of one kind or another, or rest or exercise, were beneficial, have filled literature; unsupported assertions, marvelous cures, and fantastic treatments have too often been advanced on the slenderest of grounds.

With the realization that partial paralysis was the usual form of affection, it became desirable to have some scale by which to work out what should be a precise and improved treatment. The muscle test offers a practical quantitative scale by which the effects of modifications of treatment may be studied week by week and month by month.

The method is designed to test, under conditions of constant position and leverage, by a series of spring balance pulls, the power of the muscles which govern the movement of the limbs. The value of the test consists in the possibility of duplicating exactly the conditions of the first test at succeeding ones, so that a definite idea of gain or loss in muscular strength can be registered in pounds. It is applicable for all tests of power in normal muscles, for determining loss or gain in power at stated intervals, and for the determination of the degree of initial weakness in paralyzed muscles. It has been applied to infantile paralysis cases for one year in consecutive tests varying in frequency from ten days to three months. The result has been an accurate register of general gain and occasional loss in these cases under treatment. The record has the advantage of representing concisely, in figures, the results of very detailed muscular examination and of presenting at later examinations the initial and intermediate conditions of the case.

The accuracy of the test depends upon the training of two persons, an operator and an assistant, to coördinate the pull of the muscle and the registration of the pull on the scales, and upon the maintenance with exactness of the positions and leverage relationships outlined individually below. Accurate spring balance scales (No. 5 in Fig. 1) are used, of 4 sizes: 1 to 4 lbs., graded in ounces; 1 to 30 lbs., 1 to 50 lbs., and 1 to 100 lbs. The readings are taken to the half pound except on the ounce scale.

The operator in general controls and maintains the correct position of the subject, stimulates the subject to innervation, braces and guides the limb tested, and calls the moment of give in the muscle tested through watching the action of the muscle itself. The assistant makes the pull along lines accurately determined, beginning and stopping under the direction of the operator. The same command directs the muscular pull of the patient and the scale pull of the assistant. In all cases where the position of the assistant makes this possible, the scale reading is taken by him at the moment when the yielding in the muscle is called by the operator. Except under special circumstances, plantar flexion is the only reading which the operator is required to make.

Twenty-two readings are taken, for each of which the best position of the subject for the accurate reading of the scales and for constant

leverage in limb action has been determined experimentally. The order in which muscles are tested is immaterial except under conditions of weakness, but it is best that the order be constant so that all tests may duplicate each other as completely as possible. The apparatus required is shown in the accompanying illustration and referred to by the number on each piece, as they come into use in the description of the measurements themselves.

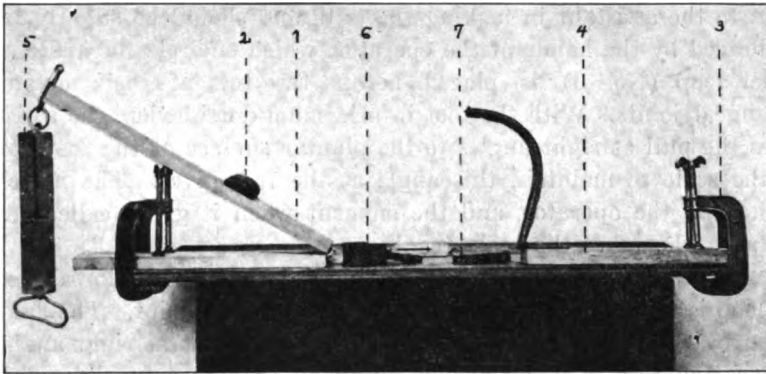


FIG. 1. Apparatus used in muscle test. The numbers in the illustration are referred to in the text.

In the lower extremity the test records the following movements: plantar flexion, dorsiflexion, inversion, eversion, adduction, abduction, hip extension, hip flexion, knee extension, knee flexion. The position of the operator and assistant in each movement is determined by their own convenience for fulfilling the other conditions of the test. The operations of these two individuals and the position and action required of the subject, for the measurement of these movements, are as follows:

**PLANTAR FLEXION.** The subject lies on his back on a smooth table. The foot is braced against a three-to-one lever (No. 1). The scale hook is inserted in the ring of the lever upright. The lever must be adjusted so that the ball of the foot in maximum plantar flexion rests squarely upon the lever pad (No. 2), with the upright at an angle of from 60 to 80 degrees to the table. The lever is held in position by C-clamps (No. 3). The pull is made by the assistant from the head of the table with the scale horizontal and in line with the leg being tested, and is increased in intensity to the point where the muscular resistance is overcome. To prevent slipping on the table, the shoulders of the subject are held by the hip-braces (No. 4). The muscle gives at about 45 degrees of plantar flexion, with a rather sharp break in

the resistance offered to the spring balance. All measurements of degrees are made to the plane of the table, unless otherwise specified. The operator guides the position of the foot, stimulates the patient to innervation, and calls the moment of break in the muscle to the assistant, for reading, or reads the scale himself. The reading of the scale must be simultaneous with this break.

**DORSAL FLEXION.** The general position of the subject is the same. The foot should be flush with the end of the table, to give freedom of action to the assistant in making the pull, and should be slightly lifted and braced by the hands of the operator, which encircle the ankle. The leather loop (No. 6) is placed across the toes at their metatarsophalangeal joints. With the foot in maximum dorsiflexion, the assistant makes the pull at right angles to the plantar surface of the foot, lowering the scale to maintain this angle as the foot gives. The muscle is watched by the operator, and the moment when it gives, called to the assistant, who takes the scale reading.

**INVERSION.** Body position of the subject the same as in dorsal flexion. The loop is across the inner surface of the great toe joint. The ankle is braced by the hands of the operator. With the foot at right angles to the leg, the foot is inverted and adducted as far as possible without inward rotation of the leg. The pull is opposite in direction to the muscular contraction, horizontal, and in the same vertical plane as the foot. The assistant swings the scale so as to maintain this relationship as the foot gives. The reading is taken by the assistant at the moment when the operator calls the break in resistance of the foot.

**EVERSION.** General position as in dorsal flexion. Loop at the outer surface of the distal end of the fifth metatarsal. The foot is at right angles to the leg and is everted and abducted as far as possible without outward rotation of the leg. The pull is horizontal and in the same vertical plane as the foot, with a scale swing to maintain this position. The break is called and read as above.

**ADDUCTION OF THE LEG.** No change in general body position of the subject. Two hip-braces (No. 4) are placed in line with the crest of the ilium on each side of the pelvis and attached to the table with the C-clamps. With one hand in the popliteal space and the other below the heel, the operator gently supports the weight of the leg, raises the leg about fifteen degrees from the table, and maintains the foot vertical to prevent leg rotation. The subject contracts the inner muscles of the thigh so as to swing the leg inward across the median line about fifteen or twenty degrees. This angle of contraction is a matter of comfort to the subject and varies with the individual. The angle of elevation of

the leg from the table must be constant. The subject, during the pull, braces the trunk with the hands by pushing against the clamps of the hip-brace on the side opposite to that being tested. The loop is placed just above the internal malleolus. The pull is outward, horizontal, and at right angles to the leg. It must swing so as to preserve this angle as the leg gives. The operator calls for the reading as the leg becomes exactly parallel to the median plane of the body. This reading can be taken in the same fashion with the loop at the knee just above the patella. The power here, with allowance for minor individual variations in leg length, doubles the ankle pull through halving the distance of the measuring spring balance from the fulcrum. The knee pull is used where the quadriceps is weak and it is difficult for the subject to maintain knee extension while making the adductor pull from the hip.

**ABDUCTION OF THE LEG.** The details of position and bracing in this pull differ only in the direction of the muscular action, which reverses the bracing and the positions of the operator and assistant. The loop is just above the external malleolus. The subject contracts the muscles which abduct the hip so as to swing the leg outward from the median plane at an angle of thirty or forty degrees, according to individual comfort. The pull is inward, horizontal and at right angles to the leg. This angle and the angle of fifteen degrees of leg elevation must be maintained constant throughout the pull, exactly as in adduction. The operator calls for the scale reading as the leg becomes parallel to the median plane. The test is made at the knee where the quadriceps is weak.

**HIP EXTENSION.** The subject lies on the side opposite to that to be tested, with the hips directly one above the other. The abdomen is braced against the hip-clamp used in abduction and adduction. At the lower end of the table, two C-clamps, across which a small board is placed for comfort, are used by the subject as a brace. He pushes against this with the foot of the leg not being tested, to secure steadiness. The trunk is braced forward, by the subject, by holding to the edge of the table with the hands. The operator maintains the position of the abdomen against the hip brace with one hand, and with the other supports the weight of the leg to be tested, and keeps the leg parallel to the table. The loop is at the knee across the popliteal space. The leg is placed in maximum extension with the knee straight. The direction of pull of the balance is slightly less than 90 degrees to the leg, being deflected towards the trunk, and is exerted horizontally. The angle of the pull must be constant throughout the movement. The operator calls for the reading as the leg crosses the line of the trunk, or if the muscle gives before this, the reading is taken when the muscle yields.

**HIP FLEXION.** Side position and foot brace, as for hip extension. The small of the back is against the hip-brace. The subject maintains the rigidity of the trunk by pushing with the hands against the opposite hip-brace. The operator supports the leg parallel to the table, with



FIG. 2. Test for hip flexion.

one hand at the knee and the other at the ankle. The loop is at the knee just above the patella. The knee is well bent, and the thigh is flexed above the right angle. The pull is horizontal and as near as possible at right angles to the femur. The reading is taken when the muscle gives.

**KNEE EXTENSION.**—The subject lies on the face on the table with the lower leg flexed at the knee and vertical to the table. The loop is at the ankle just proximal to the malleoli. The assistant stands at the head of the subject, bracing the shoulder with one hand. The pull is horizontal, and parallel to the median plane. The operator braces the knee on the table with one hand, and with the other at the ankle limits the extension. The movement begins from the perpendicular position, and the effort of the subject to extend the leg and the pull of the assistant must start simultaneously at the command of the operator. Both pulls should begin slowly, and it is essential that the muscle pull and the pull of the spring balance should develop together in this test. The leg is not permitted to extend from the perpendicular position further than to within 75 degrees of the table. Greater extension than this changes the leverage and produces inaccuracy. The pull of the

assistant continues until the knee is drawn back to the original position, the operator calling for the scale reading exactly as the leg crosses the perpendicular line. The quadriceps test is the most accurate of all tests as to repetition, but also the most liable to error if over-extension is permitted, before the balance pull begins to draw the leg back to the vertical position.

**KNEE FLEXION.** General body position of the subject and brace by the operator the same. Ankle loop reversed in direction and the assistant at the foot of the table. The subject places the leg in maximum flexion. The pull is horizontal and rotation of the hip should be minimized. The operator calls for the scale reading as the lower leg crosses the perpendicular position. If the reading is taken with the leg more than fifteen degrees beyond the perpendicular, accuracy is destroyed through change of leverage.

This group of leg tests can be made in half an hour where the subject responds easily to directions and the operator and assistant are accustomed to coördinate work. Every reading is repeated as a check. The readings agree very closely unless there is an error in technique. In the first test the pull generally rises slightly on the repetition because the subject understands the requirements of the movement better the second time it is made.

In the upper extremity the test records the following movements: Pectoralis, latissimus dorsi, anterior deltoid, posterior deltoid, forearm extension, forearm flexion, wrist extension, wrist flexion, finger extension, finger flexion, thumb adduction, thumb abduction. In all the movements, the break is called by the operator and the scale read by the assistant. For the first four movements the loop is at the elbow just above the condyles of the humerus.

**PECTORALIS.** The subject stands or sits, with the shoulders and the hips in the same vertical plane. If standing, he braces the thigh well against the table to prevent loss of balance. The arm is drawn as far as possible across the front of the body, just clearing the trunk, with the forearm in pronation. Any brace of the body with the opposite arm is permissible which does not disturb the plane of the shoulders and hips. The pull is horizontal and outward posteriorly at an angle of 30 degrees to the lateral plane of the body.

**LATISSIMUS DORSI.** The subject stands or sits, as above. The fist is closed, and with the dorsum of the hand towards the back, the arm is drawn as far as possible, across, behind the body, just clearing the trunk. The pull is horizontal and outward anteriorly at an angle of 30 degrees to the lateral plane.



**ANTERIOR DELTOID.** Positions of the subject the same. The opposite hand holds to any support which does not elevate the shoulders. The arm being tested is raised to the level of the shoulder, and brought forward to an angle 30 degrees from the lateral plane of the trunk. The pull is backward and downward, establishing an angle of 60 degrees with the upper arm, and maintains this angle as the arm gives.

**POSTERIOR DELToids.** The subject stands or sits, as in the other shoulder tests. The arm is raised to the level of the shoulder posteriorly at an angle of 30 degrees to the lateral plane of the trunk. The pull is forward and downward, establishing an angle of 60 degrees with the upper arm, and maintains this angle as the arm gives.

**FOREARM EXTENSION.** The subject lies on the back, with the arm at the side, and the forearm perpendicular to the table, against which the elbow rests. The hand is closed with the thumb pointing to the shoulder. The loop is at the wrist just proximal to the styloid process of the ulna. The assistant stands at the head of the table and braces with one hand the shoulder of the side to be tested. The operator braces the elbow on the table with one hand, and with the other at the wrist limits the extension of the forearm. The pull is horizontal. At the direction of the operator, the extension of the forearm and the pull of the assistant start together slowly. Extension is permitted to from 5 to 15 degrees from the perpendicular, and is overcome by the assistant. The call for the reading of the scale is made just as the forearm crosses the vertical line.

**FOREARM FLEXION.** No change in the position of the subject nor the bracing of the operator. Loop just proximal to the styloid process of the radius. The forearm is placed in maximum flexion with the elbow on the table, the hand closed, and the thumb pointing toward the shoulder. When the muscular power requires it, the foot brace described in hip extension is used in the same fashion by the subject to prevent slipping during the movement. The pull is horizontal. The operator calls for the scale reading as the forearm crosses the perpendicular line.

**WRIST EXTENSION.** The subject extends the entire arm laterally and anteriorly, according to individual comfort. With the palmar surface of the hand vertical and the fingers extended, the wrist is put in maximum extension. The operator encircles the wrist with his hands, bracing the subject's arm in the extended position. The small loop (No. 7) is across the dorsum of the hand, just distal to the metacarpals. The pull is exerted horizontally and at an angle slightly less than 90 degrees to the hand, being deflected towards the wrist. The angle of pull must be constant, and to secure this the assistant swings the scale through

an arc as the hand gives. The accuracy of the reading depends absolutely upon maintaining the direction of the pull and upon the correct placing of the loop, and is most important in this and the three following tests.

**WRIST FLEXION.** With the arm well away from the side, the subject flexes the elbow according to comfort. With the fingers flexed at right angles to the palm, and the palmar surface of the hand in the vertical plane, the subject puts the wrist in maximum flexion. The small loop is across the palm at the crease formed by the finger flexion. The operator braces the wrist and arm in this position, encircling the wrist with both hands. The pull is horizontal and at an angle slightly less than 90 degrees to the dorsal surface of the hand. The angle of the pull must be maintained by an arc swing of the scales.

**FINGER EXTENSION.** The subject extends the arm as for wrist extension. The hip-brace is attached lengthwise to the side of the table. The palm of the hand well below the palmar crease is braced by the operator against the curved upright of the brace. The small loop is across the fingers dorsally, just proximal to the first interphalangeal joint. The pull is horizontal, and at an angle slightly less than 90 degrees to the extended fingers and deflects towards the wrist.

**FINGER FLEXION.** The position of the subject and the brace by the operator are the same. The small loop is placed across the fingers on the palmar surface, just proximal to the first interphalangeal joint. The palmar surface of the hand is vertical against the brace. The pull is horizontal and slightly less than 90 degrees to the proximal phalanges. The deflection is towards the dorsum of the hand.

**THUMB ADDUCTION.** With the palmar surface down and the hand horizontal, the operator braces the extended fingers with one hand and the wrist with the other. The small loop is placed at the interphalangeal joint of the thumb. The subject adducts the thumb as far as possible under the palm. The pull is horizontal and at right angles to the thumb joint. The call for the reading is made by the operator just as the thumb appears from under the hand.

**THUMB ABDUCTION.** General position of the hand and brace by the operator the same as for the preceding test. The subject adducts the thumb in the same horizontal plane as the hand. The position of the small loop is identical with that of adduction, but reversed in direction. The pull deflects downward from the horizontal just enough to escape the palmar surface of the hand. It is exerted at right angles to the thumb.

The complete arm test requires half an hour, and each reading is repeated as a check.

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### HUGH OWEN THOMAS.

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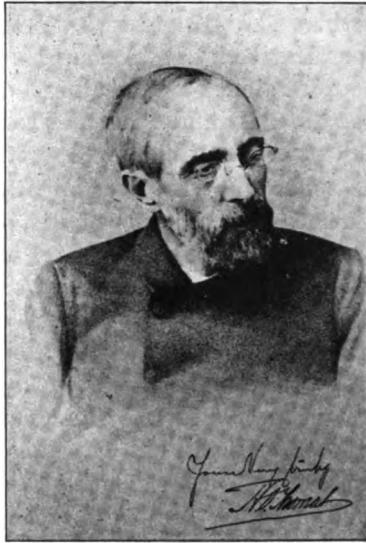
(From the Orthopedic Department of the Massachusetts General Hospital.)

IN the London *Lancet* for January 17, 1891, among the obituary notices there was one which began as follows:

"A grief so profound and widespread as that which was manifested at Liverpool on the tenth instant, when the remains of Dr. Hugh Owen Thomas were laid to rest, is seldom witnessed. There can be no more eloquent or touching testimony to the worth of a man's character than the tears of the poor among whom he lived. The toilers at our docks and warehouses are not sensitive beings, and the daily struggle of their lives is too earnest to admit of much display of sentiment. To see thousands of these, then, men as well as women, as anyone might have done in Liverpool last Saturday, stirred to their very depths by an emotion that found expression in passionate sobs and tears, as they lined the streets or pressed forward to gaze into the open grave, proves that its silent occupant had won his way to their hearts."

Hugh Owen Thomas was born in Anglesea, North Wales, August 23, 1834. He underwent the usual preliminary training, and in 1850, when sixteen years old, became an articled pupil to his uncle, the late Dr. Owen Roberts of St. Asaph. Mr. Thomas always referred in kindly terms to this apprenticeship and to the advantages he derived from association with so cultured an intellect and so experienced an instructor.

After a sojourn in Edinburgh and London he was admitted a member



HUGH OWEN THOMAS.

of the Royal College of Surgeons in 1857. He soon afterwards started as a general practitioner, and in a short time became encompassed with work. In 1873, when forty-one years old, he published his first pamphlet, the subject being "The Treatment of Compound Fracture of the Lower Jaw."

He was a man of frail health and was often beset by acute bodily suffering. This condition of his health gave but little promise of the fruitful labor which his thirty-five years of practice was to bring forth. His naturally great ability and the force of a quietly dauntless character enabled him to overcome every obstacle and to win his way to the very front rank in the department of surgery to which he more especially devoted himself.

That this department of surgery was not a small branch is easily seen by looking over a list of the articles he wrote. Among these, of which there are many, may be mentioned, for example: "The Treatment of Diseases of the Hip, Knee and Ankle Joints," in which book were first figured the splints for the hip and knee which are called "Thomas Splints"; "The Treatment of Intestinal Obstruction"; "Inhibition of the Nerves," an article which aimed at rationalizing the art of prescribing; "The Collegian of 1666 and the Collegian of 1885," which was a polemical brochure justifying the publication of his intestinal work and extolling the principles advocated by Sydenham when compared to those of modern physicians. Other articles were: "The Principles of

the Treatment of Fractures and Dislocations," "Injuries and Diseases of the Trunk and Upper Extremity." Among his minor contributions are : "Fractures of the Patella," "Fractures of the Neck of the Femur," "A Review of the Past and Present Treatment of Joint Disease," and a description of a new lithotomy operation.

He was a busy practitioner and was never appalled by the amount of work ahead of him. The great majority of his patients were of the poorer class. That a person could pay a large fee was of no importance to him and he gave no preference to the latter over the former.

One day in every week—the only day, indeed, on which the poorer people could visit him without loss, but the day on which most professional men seek some repose from work—was, during many of its hours, given up exclusively to the poor. Every Sunday throughout the year his house was crowded with cripples, old or young.

The one form of recreation which Mr. Thomas allowed himself, and to which he was never tired of going, was his workshop. Here, among his lathes and other mechanical appliances, he worked out by careful experimentation the splints which to this day bear his name. Hanging on the walls of this shop were the various models he had made while perfecting his splints, as well as other ingenious contrivances which he used in his practice. It is significant to say here that, in spite of the perfection of his splints, Mr. Thomas looked upon them as very secondary to a correct appreciation of the principles which he lays down as governing the successful treatment of diseased articulations.

The machine shop was also full of strange old cripples or youths with broken health, whom again and again he would take into his lathe room, where they might remain for years or until some other place could be found for them through his influence.

For thirty-three years he was never known to take a vacation where his work was given over for a time. His range of reading extended far beyond his medical and surgical work, and carried him into politics and history. In antiquities (especially those of Egypt) he was an enthusiast.

His home life was just what might be expected of a man whose sympathies for others made him give up practically his whole life to relieve the sufferings of his fellow men. He had no children, but the unwearying and loving devotions of his wife, who sympathized with him in all his undertakings and shared in his affection for the poor, and the love, almost amounting to veneration, of nephews and nieces, and old and attached servants, made this inner home one of the most restful and beautiful places on earth. It was impossible for any one to know him

intimately without being moved to admiration by the purity and unselfishness of his life, and even the little eccentricities that played over the surface of his character, and which some, who looked no further, thought to constitute it, were of the lovable kind, and served but to bind him more closely to the affection of his friends.

Mr. Robert Jones was a nephew-in-law of Mr. Thomas and always held him in great esteem. In 1913 Mr. Jones addressed the Liverpool Medical Institution, his subject being, "Hugh Owen Thomas on Intestinal Obstruction Thirty Years Ago." A few quotations from this article will give an excellent idea of Mr. Thomas' powers of observation, his ability to draw inferences from these, and his frankness in carrying out a treatment, no matter how great the difficulties, for which he had a rational basis.

Mr. Jones said that at the time when Mr. Thomas was first in practice the group of symptoms coming under the head of Intestinal Obstruction was attended by an alarming fatality. With the exception of an occasional enterostomy no operative procedure was then practised. The treatment recognized by all authorities was, whatever the cause, by purgatives and enemata. Thomas' observations of the effects and the results of this method led him to outline a course of treatment which was in every detail opposed to the prevailing beliefs. He believed that purgatives acted only upon the healthy portion of the gut, and still further obstructed by driving the contents onto, but not through the obstruction. Enemata he objected to because the bowel below the obstruction was usually empty and the enema caused peristalsis above the site of the obstruction. He advocated and showed by a large number of cases that by reducing the intestinal tract into a mere lifeless tube and by regulating the diet, the intestinal contents above the obstruction could be transformed into a thin fluid, which would pass through the obstructed region. He used morphia freely, because not only did it tend to relieve the pain,—which is an important element in the exhaustion of these cases,—but also because at the same time it checked injurious peristalsis. As regards diet in these cases he forbade all solids and this included milk, which he considered a most dangerous and most deceptive article of food. He felt that by this method it was possible to relieve the obstruction and to obtain a full motion in from three to six weeks, which neither opium nor any method could check.

Mr. Thomas believed that this same line of treatment should be used in the care of fractures, especially in fractures of the neck of the femur in old people. In his fracture cases he preferred not to have the bowels move for three weeks unless they did so of themselves, because by not using

the bed pan there was less danger of interfering with the position of the bones. He never saw any trouble come from such prolonged constipation, provided the diet had been properly restricted, and to the end of his days he treated all of his severely fractured limbs in this way. An example of the diet he prescribed is interesting because he must have had a wonderful control over his patients to be able to keep them to it. For breakfast he allowed tea, biscuit and butter; midday meal, some flesh broth, thickened with arrowroot, sago or rice; evening meal, same as that allowed for breakfast; supper, arrowroot and water, with either wine or brandy added to flavor it, milk being especially prohibited as the prolongation of the constipation to a spontaneous termination cannot be tolerated by some persons if milk is consumed.

It was natural that a man who had the courage to oppose the prevailing beliefs of the time should be the object of much criticism. He was always most tolerant of criticism of himself, and could not imagine that any one could be other than grateful when their errors were pointed out during their lives.

One of the things which helped him to live up to his ideals and to keep him going on with his work in spite of criticism is expressed by the following quotation from Ecclesiastes, of which he was very fond: "Wherefore I perceive that there is nothing better than that a man should rejoice in his own works for that is his portion, for who shall bring him to see what shall be after him."

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# Orthopedic Society Meetings

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The interest in Orthopedic Surgery is well shown in the development of certain societies. A few years ago the Interurban Orthopedic Club was founded, with a membership of about twenty men of about the same age. They represented the younger men in the Eastern part of the country, who were willing to meet in various cities for the discussion of clinical work twice a year.

Based somewhat on the same idea, the Central States Orthopedic Club was founded, taking in the cities of the territory indicated. This is also an active and limited group of men, who believe in visiting other clinics and associating with their confrères.

Since these associations are necessarily limited, so as to bring together men of the same age, it is necessary to form new societies from time to time, and the latest one is called the Eastern States Orthopedic Club, covering very much the same territory as the original Interurban. These associations permit of full discussions of the work in different clinics, being very informal in nature. The program of these societies will be found in the JOURNAL.

## EASTERN STATES ORTHOPEDIC CLUB.

The Eastern States Orthopedic Club was organized and held its first meeting in Philadelphia on April 6, 1916. The morning session was held in the Orthopedic Department of the University Hospital, and the afternoon session was held at the Widener Memorial Industrial Training School for Crippled Children.

DR DEFOREST WILLARD showed:

1. Cases illustrating the methods of bed treatment and fixations by means of an anterior wire splint in tuberculosis of hip and spine.
2. Cases illustrating the need of long continued post-operative support after the Albee operation.
3. Cases illustrating the improvement obtained by Abbott casts in scoliosis.
4. Cases illustrating certain conservative treatment of birth palsy, by means of continued abductions.
5. Cases showing results of transverse horizontal section and subastragalar arthrodesis in paralytic foot deformities.

He operated upon a case of infantile paralysis, showing the method of doing subastragalar arthrodesis.

DR A. BRUCE GILL showed:

1. Four cases of tendon transplantation that produced over-correction of the deformity and required re-transplantation.

(a) Calcaneo-valgus,—corrected by transplantation of the peroneus brevis into the tendo Achillis and the extensors of the fourth and fifth toes and the extensor proprius hallucis into the periosteum of the scaphoid. Varus appeared four years after the operation and was corrected by a subastragalar arthrodesis and a transplantation of the extensor proprius hallucis from the scaphoid to the inner side of the foot.

(b) Valgus,—corrected by transplantation of the peroneus longus, peroneus brevis, and the extensors of the fourth and fifth toes to the inner side of the foot. Over-correction appeared four years after the operation and required the transplantation of the peroneus longus to the outside of the foot.



(c) Valgus,—corrected by transplantation of peronei and extensor proprius hallucis to the scaphoid. Over-correction appeared a year and a half after operation and required re-transplantation of the peroneus longus to the outside of the foot.

(d) Valgus,—corrected by transplantation of peronei and extensors of fourth and fifth toes to scaphoid. Over-correction developed two years after operation and required re-transplantation of the peroneus longus to the outside of the foot.

2. A case of marked calcaneo-valgus improved by arthrodesis of the ankle and of the astragalo-scaphoid joint. Osteotomy of the femur was done to make a back-knee.

3. A case of calcaneo-valgus with flexion deformity of the knees corrected by a horizontal transverse section of the left foot to correct the calcaneo-varus, a transplantation of the semi-membranosis to the patella; and, later, an arthrodesis of the right ankle and an osteotomy of the right femur to make back-knee; and still later, an arthrodesis of the left ankle and an osteotomy of the left femur to make back-knee.

4. A case showing a cure of calcaneus deformity by transplantation of the peronei to the os calcis. The fascia lata was sutured to the posterior margin of the great trochanter to overcome external rotation of the femur. A transverse horizontal section and later an arthrodesis of the ankle were performed in the other foot to overcome calcaneo-valgus, and an osteotomy of the femur was made to make back-knee.

5. A case of marked calcaneus corrected by transplantation of the tibialis anticus and the peroneus brevis into the os calcis. The extensor proprius hallucis was later transplanted to the scaphoid to correct valgus. Foot is now in good position with strong action of the transplanted muscles.

6. Two cases of transplantation of the tensor fascia femoris to the patella; one by means of a silk tendon, the other by means of a strip of the fascia lata extending from the insertion of the tensor down to the knee.

7. A case of arthroplasty of the knee. Operation performed Mar. 28, 1913. Patient now has action, painless motion from 90° to 180° with excellent lateral stability. The knee is as strong and useful as a normal knee.

8. Two cases of obstetrical paralysis of the arm. One child was improved by a series of casts applied without an anesthetic to hold the arm in abduction and external rotation with supination of the forearm. The other had a posterior subluxation. Open operation was performed; the shoulder joint was opened by detaching the deltoid from the acromion and the spine of the scapula and turning it downward. The tendon of the subscapularis and the posterior portion of the capsule were divided to allow the arm to be brought into external rotation. The arm was dressed in plaster in abduction and external rotation.

9. Two cases of tuberculosis, one of the hip and one of the spine, were shown to illustrate the value of sunshine treatment. Both patients were extremely ill when the treatment was begun and apparently owe their lives to the painstaking and persistent sunshine treatment.

## Book Reviews

*A Text-Book of Fractures and Dislocations.* By KELLOGG SPEED, M.D. pp. 888, with 656 engravings. Philadelphia and New York: Lea and Febiger. 1916.

This is a complete work on fractures and dislocations, the material for which was taken largely from the Cook County Hospital. It is one of the most thorough pieces of work that has lately been presented, and is well illustrated.

It is so thorough and full of detail that it is a question whether it were not better suited for a reference book for practitioners than a text-book for students. The writing of the text and the make-up of the book are good, and show careful, hard work.

*Lateral Curvature of the Spine and Round Shoulders.* By ROBERT W. LOVETT, M.D. Third edition, with 150 illustrations. Philadelphia: P. Blakiston's Son and Company. 1916.

The third edition of this book is very timely in its appearance, in bringing up to date the discussion of the treatment of structural lateral curvature, which has been of extreme interest during the last few years. It seems to the reviewer that the author's statement of the present standing of forcible correction in treatment, and his discussion of other methods than his own, is very fair and definite. The principal change in this edition lies in the extension of the portion of the book that is devoted to treatment.

There is a very interesting chapter which is introduced for the first time, on the History of Scoliosis, which makes a very good introduction. One chapter only is devoted to the question of Faulty Attitude, which is so closely connected with postural lateral curvature and which cannot be very well separated. It seems that this portion might be left out or better extended.

*Notes on Military Orthopedics.* By PAUL BERNARD ROTH. London: Henry Kimpton. 1916.

This is a brief and incomplete pamphlet, published in book form, on certain orthopedic conditions peculiar to military surgery. The subject is treated most superficially, and is at times open to considerable criticism, especially as to principles of treatment and the apparatus advocated. The book, likewise, omits many essentials, for, while such subjects as corns and spondylolisthesis are given much prominence, nothing whatever is said of either the prevention or treatment of many common contractures, of immobilization of joints in the best position for future function, of the maintenance of nutrition and tone in muscles, of alignment in fractures, of innumerable varieties of sprains and other traumatic conditions in the extremities and back, or of the sequelae of bone and joint infections—all of which make up by far the bulk of real military orthopedics. The section on artificial limbs has much to commend it. An appendix dealing with a proposed organization for the care of crippled soldiers, furnishes a possible clue to the purpose of the pamphlet.

# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.
- X. War Surgery.

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES. NERVE LESIONS WITH ARTHROPATHIES.

THE OPERATIVE TREATMENT OF PARALYSIS DUE TO THE SEVERANCE OF THE RADIAL NERVE. G. Axhausen. *Berliner klinische Wochenschrift*, liii, No. 7.

The author states that during his service in the army in the present war he has seen cases of destruction of the radial nerve at the point where it emerges from the supinator brevis muscle. The central stump is easy to locate, but the distal branches are exceedingly difficult to isolate, being often lost in the connective scar tissue, and repair of the nerve is impossible. Heretofore supportive apparatus was alone used, but he has recently operated on a case, using a modification of the operation advised by Vulpinus for this condition. Vulpinus recommends the transplantation of the flexor carpi radialis muscle and the flexor carpi ulnaris to the dorsal surface of the wrist by means of incisions on each side. The tendons are brought around the bones, one on each side. At the same time he recommends a tenodesis of the extensor tendons. Through a dorsal incision they are attached to the extensors and the abductors of the thumb and the first finger. As this did not seem to be decidedly successful, Axhausen modified the procedure by bringing the tendons through the interosseous space and ligament, making use of the principle that transplanted tendons should run as nearly as possible parallel to their old course. By this, almost full extension and abduction of the thumb and the first finger were obtained. Later on he intends to stiffen the wrist by a tenodesis of the extensor carpi radialis longior and brevis and the extensor carpi ulnaris into bony grooves on the posterior surface of the ulna and the radius. Re-education of the muscles was necessary before the above result was accomplished.—*Ralph S. Bromer, Louisville.*

ACUTE POLIOMYELITIS. F. E. Batten. *Lancet*, April 15, 1916.

This is an abstract of the Lumleian Lectures, delivered before the R. C. P. of London, March 30, April 4 and 6. He considers the epidemiological, experimental, and clinical aspects of the disease, together with the treatment.

Many names for the disease have been suggested. "Acute poliomyelitis" has come into such common use that it is inadvisable to attempt to replace

it. "All that is required is that 'poliomyelitis' shall be recognized as one of the acute specific fevers, having a tendency to affect any part of the central nervous system, and giving rise to a variety of symptoms dependent upon the portion affected."

Under "clinical features" the different types are discussed. The grouping on an anatomical basis, as suggested by Wickman, is followed: the spinal form; the bulbar, pontine, and mid-brain form; the cerebral form; the cerebellar form; the neuritic form; the meningitic form; and the abortive form.

Reference is made to the relapses, and to so-called "joint" cases. The frequent association of herpes zoster with the disease is remarked.

Treatment: Isolation. In a hospital, bed isolation is sufficient. Careful attention should be paid to the discharge from the nasal and buccal mucous membrane. Experimentally it has been shown that serum from one recovering from an attack has power to destroy the virus in vitro, but has no power to prevent the development of the disease when injected simultaneously or after the virus has been injected.

Rest is the most important factor in treatment; absolute rest for at least three weeks. Splints to be used as soon as possible, applied with the muscles in a zero position.—*J. J. Nutt, New York.*

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LANDRY'S PARALYSIS. REPORT OF A CASE. Hansell Crenshaw. *Journal Med. Assn. of Georgia*, March, 1916.

A detailed report of a case is given. The patient had hookworms. The paralysis was total of voluntary muscles from toes to head. The unusual point was his complete recovery. He walked out of the hospital at the end of the tenth week.—*F. G. Hodgson, Atlanta.*

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EARLY MANAGEMENT OF ANTERIOR POLIOMYELITIS. C. B. Francisco. *Missouri State Med. Jour.*, January, 1916.

This article is a résumé of the generally accepted ideas, and there is nothing new presented. Stress is laid upon the early diagnosis, the prevention of deformity, early muscle training, and operative procedures only when there is a very definite indication after a period of at least two years.—*Custis Lee Hall, Boston.*

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SPASTIC PARALYSIS IN CHILDREN. Jacob Grossman. *New York Med. Jour.*, March 11, 1916.

Grossman reports in detail seven illustrative cases of spastic paralysis in children. In discussing the treatment, he states that where ophthalmoscopic examination reveals increased intracranial pressure, and where there is not a great amount of interference with the mentality of the patient, subtemporal decompression should be performed. In the other cases, and in the after-treatment of cases operated upon, massage, electricity, manipulation, supports, tenotomies, and muscle education usually offer relief to the patients, and influence to a certain degree the existing condition.—*A. J. Davidson, Philadelphia.*

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A NEW SUPPORT FOR RADIAL PARALYSIS. H. Hildebrand. *Munch. med. Woch.*, March 7, 1916, lxiii, No. 10.

This apparatus is designed for paralysis of the radial nerve, due to gunshot, shell, and other injuries. It consists of a leather gauntlet, which encircles the wrist and the lower forearm, and continues down over the dorsum of the hand to the knuckles, leaving the fingers and the palmar surface of the hand entirely free. Upon this, over the distal ends of the metacarpals, is

placed a clock spring for each finger. At the distal end of each spring is a small sling, which holds the finger at the proximal interphalangeal joint. This furnishes extension for the proximal phalanx, and the strength of the spring is so adjusted that it causes no fatigue in prolonged flexion, such as is necessary in writing. The extension of the thumb is secured by an elastic band which runs from a stiff leather sling, covering the whole proximal phalanx of the thumb, to the radial side of the gauntlet.

The advantages claimed for this are the ease with which certain movements, such as writing, can be performed, the greater comfort as compared with the older types of apparatus, which depended on elastic bands for the same purpose, and the fact that the slings for the fingers are placed at the point of the insertion of the paralyzed tendons.—*Ralph S. Bromer, Louisville.*

SUDECK'S ATROPHY OF BONE TISSUE. H. Hofmann. *Münch. med. Woch.*, Feb. 22, 1916, No. 8.

Following injuries of various kinds, including fractures as well as sprains and soft part injuries about the joints, the author has noted an acute bone atrophy, different from that occurring merely as the result of inactivity. The condition first described by Sudeck and by Kienböck, and bearing the name of Sudeck's atrophy or acute bone atrophy, was studied more carefully after the advent of the X-ray. The spongy portion is attacked first. It presents a peculiar washed-out marbled appearance, and there is marked lack of contrast. Restoration to normal sometimes occurs with resumption of use, but may remain for a long time afterwards. Following Sudeck, the author treats his cases by immobilization in plaster, until there is definite evidence of repair. Hot air and hydrotherapy may be employed later. The author's contention that the condition is a distinct clinical entity, a trophoneurosis, does not seem especially well founded. His arguments against the conception that it is an atrophy following disuse are: Rapid onset, that is in six to eight weeks after injury; the peculiar marbled or mottled appearance, rather than a uniform fading; and the absence of this condition in some cases after more prolonged disease.—*F. J. Gaenslen, Milwaukee.*

ANTERIOR POLIOMYELITIS; CONCERNING THE TREATMENT OF INFANTILE PARALYSIS. H. M. Michel. *Jour. Med. Assn. of Georgia*, March, 1916.

Treatment is divided into prophylactic, meaning rest and the prevention of deformities; and operative treatment, including manipulation, tenotomies, osteotomies and tendon transplantation. A typical tendon transplanting operation is described in detail. He advises arthrodesis for flail joints.—*F. G. Hodgson, Atlanta.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

RÔLE OF THE SEMINAL VESICLE IN GONORRHEAL RHEUMATISM. C. F. Anderson. *Tenn. State Jour.*, April, 1916.

This is largely a review of the work of Fuller and Belfield. Nothing new.—*R. Wallace Billington, Nashville.*

CHRONIC ARTHRITIS. Thomas McCrae. *Penn. Med. Jour.*, April, 1916.

This article is directed to questions bearing on the etiology and treatment of chronic arthritis. McCrae suggests that the indefinite knowledge of the etiology in many of the cases of chronic arthritis is largely responsible for the unsatisfactory management of their treatment. He shows that the best results attained from treatment are in those cases in which there is a proven

etiology, such as in gonococcic, tuberculous or specific arthritis. For the general management of cases of chronic arthritis the following measures are advised:

(1) Early recognition before material damage is done, so that the proper measures can be adopted at the onset. (2) Thorough search for the focus of infection, and efficient treatment if this is found. (3) Every effort to improve the patient's powers of resistance, and this is particularly important if the source of infection cannot be found, in hope that the patient may overcome the infection by his own powers of resistance. This involves the best possible nutrition, good hygiene, free elimination, and the blood in good condition. (4) The effort to lessen the damage to the joints, under which head come the proper uses of exercise and rest; local measures, such as aid the circulation or relieve pain. (5) The relief of pain both for the sake of the patient, and to allow of movements in some cases. (6) The prevention of deformities.—A. J. Davidson, Philadelphia.

#### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

RACHITIS IN PALERMO. S. Maggiore. *La Pediatria*, xxiv, iii, Marzo, 1916, pp. 152-156.

Of 2988 babies seen by the clinic from July, 1913, to July, 1915, 951 were rachitic; males 602, females 349. Ages, from 1 to 24 months. City, 713; country, 238. Acute stage, 408; resolving or recovered, 543. Severe cases 92; of these 31 fed on cow's milk only, 26 on goat's milk only, 35 on various foods and milk. Among these same there were 31 cases where a parent had had rachitis, 43 where one parent was syphilitic, 18 where father was alcoholic.

##### CONCLUSIONS.

1. Rachitis is distinctly widespread.
2. The majority of the cases come from the city.
3. Relatively low percentage of cases become severe. Recovery usually occurs before serious deforming lesions of the skeleton are manifest.
4. Recovery usually takes place in the second year.
5. Clinical forms may be divided into three groups:
  - (a) *Mild*: Anterior fontanelle open with thickened edges; enlarged epiphyses; rosary; slight kyphosis; incomplete or retarded dentition; only slight disturbance of skeletal development; progressive disappearance during second year.
  - (b) *Medium*: The same morphological alterations, though more evident and more marked interference with the development of the skeleton; persistence of signs after the second year.
  - (c) *Severe*: Square head; fontanelle wide open; rachitic hydrocephalus; cranio tabes; thoracic deformity (pigeon-breast); marked spinal curvature; enlargement of epiphyses; bow-legs; pain on pressure over the bones; hypotonic and atrophied muscles; osteoporosis; tumor of the spleen more or less evident; arrest of development in stature; recovery exceptional; frequent association with other diseases.
6. Severe forms found chiefly in babies fed artificially from birth and the early months of life. The relatively small number of such cases in the first year may be due to the fact that such babies die early from nutritional disturbances.
7. There exist a certain number of babies exclusively breast fed in whom

one finds severe rachitis. The number of these babies is not small. In these there is shown the influence of similar heredity (rachitism) and of syphilis in the parents.

8. There is a notable preponderance of males over females.

9. In rachitic babies, tubercular infection is not very frequent, as shown by local tuberculin reaction, nor is positive Wassermann a frequent finding.

10. In regard to heredity, especially in severe cases, similar heredity (rachitism) has a strong influence, and the effect of syphilis is notably frequent. If it is not a pure coincidence, a distinct proportion, especially in severe cases, is influenced by alcoholism in the parents.—*Calvin G. Page, Boston.*

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**PATHOGENESIS AND ETIOLOGY OF ACROMEGALY.** R. Massalongo and C. Piazza. *Il Policlinico*, Sezione medica, xxiii, Nos. 2 and 3, February and March, 1916, pp. 42-58, 84-96.

Since Pierre Marie in 1886 described the interesting dystrophy called acromegaly there have been recorded about five hundred cases. It is sufficiently rare, however, for each new case to call out a full discussion of all the factors in its pathology and etiology. The clinical picture depends primarily upon hyperfunction of the pituitary gland. Changes in other glands give rise to various complications in some cases, but not in all, or uniformly. The authors give a careful description of the history and progress of a single case. They present good photographs of head, hand, and foot, with radiograms of the same. Their argument goes on to prove that lesions of thyroids and ovaries in this case were incidental and not a necessary part of the primary process.

As an intermediate factor in the cause of the disease they would blame some constitutional predisposition to disturbance of the pituitary body.—*Calvin G. Page, Boston.*

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## V. SCOLIOSIS AND STATIC DISTURBANCES.

**HALLUX VALGUS.** C. F. Painter. *Boston Med. and Surg. Jour.*, May 4, 1916.

The author considers the variation in the relative length of the phalanges, metatarsals, and even of the other tarsal bones. This anatomical anomaly, combined with the use of a shoe which is to fit a normal foot, together with the spreading of the anterior arches and the forward thrust in walking of the "fore" foot into the narrow front of the shoe, gives the factors for the production of a hallux valgus.

Painter thinks that there is seldom in these cases a true thickening of the metatarsal or of the phalanges, but that there is slipping outward of the phalanx upon the metatarsal, with an atrophy and sometimes an erosion of the inner articulating surface of the metatarsal. Associated with these bony changes, there is often an involvement of the bursa over the inner aspect of the first metatarsal and occasionally over the head of the fifth metatarsal. Painful corns and callosities are common.

Metcalf, in his paper, has cited fifteen different operations for this condition. Painter divides the treatment into two phases: First, where deformity can be manually overcome, he uses mechanical means to hold the toe straight. Second, if operation is necessary he advocates the Hueter operation, in which the head of the first metatarsal is removed. This operation shortens the lengthened metatarsal and equalizes pressure in the metatarsal joint. The tendency of the phalanx to ride up is prevented by the use of a metal splint placed on at the time of operation. About four weeks is re-

quired before the patient can walk with comfort.—*E. B. Mumford, Indianapolis.*

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**HALLUX RIGIDUS.** C. F. Painter, *Boston Med. and Surg. Jour.*, May 18, 1916.

Painter considers as the chief etiological factor in this condition the irritation of the end of the first metatarsal by its contact with the junction of the vamp and the upper of the shoe. That it often occurs only on one side is due to the anatomical variation in the length of the tarsal or metatarsal bones.

The conservative treatment consists in the use of custom-made shoes to change the position of the junction of the vamp and upper, and the use of a metal plate for several months to prevent motion at the metatarso-phalangeal joint. Surgical treatment consists in the removal of the thickening, which is usually cartilage, of the upper surface of the head of the metatarsal. If there is an osteo-arthritic tendency, operation is contraindicated.—*E. B. Mumford, Indianapolis.*

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## VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.

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**AN UNUSUAL EXOSTOSIS OF THE SCAPULA.** Lloyd T. Brown. *Boston Med. and Surg. Jour.*, May 4, 1916.

Brown reports the removal of an exostosis on the anterior surface of the upper angle of the scapula. The patient was a girl sixteen years of age. No history of trauma. The exostosis was removed by operation, with perfect recovery. The general nervous symptoms were most marked.—*E. B. Mumford, Indianapolis.*

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## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

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**CONGENITAL BILATERAL CAPUT OBSTIPUM.** Herbert K. Thomas. *Jour. A. M. A.*, April 15, 1916, p. 1197.

Congenital bilateral wry neck is a rare condition, and is usually the result of trauma. Children born in normal face presentation sometimes show this condition for a short time. This case was one of long labor in a neurotic patient. Position was left mento-anterior with the head firmly engaged. The patient was given a rest and the baby later delivered by forceps. The face was congested and the head held in extreme extension. No hematoma. Any attempts at flexion of the head made the child uncomfortable. This persisted for one month; then the extension grew less, and at three months the condition was nearly normal. Continued extension of the fetal head in utero may cause this condition, as also continued extension during long labor.—*Edward S. Hatch, New Orleans.*

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## VIII. TRAUMATIC LESIONS, FRACTURES, AND DISLOCATIONS.

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**A PLEA FOR CONSERVATIVE TREATMENT OF FRACTURES.** H. Eugene Allen. *Northwest Medicine*, April, 1916.

As the title suggests, this valuable article lays great stress upon the older method of treatment of fractures. Allen shows by the fourth annual report of the Industrial Commission of the State of Washington, that the surgeons in the State of Washington are becoming much more conservative about operating on fractures, on account of the much shorter period of dis-



ability by means of the conservative treatment. He concludes by saying that "The deficiencies in non-operative treatment, which unquestionably do exist, should be remedied, not by operating more frequently, but by applying more carefully the fundamental principles recognized as basic in the non-operative treatment, namely, reduction under general anesthesia, traction and counter-traction, the recognition and application of anatomic knowledge, study of X-rays, massage, and the care of adjacent joints, thus ultimately improving functional results."—*Edward A. Rich, Tacoma.*

**THE FRACTURE PROBLEM.** C. F. Eikenbary. *Northwest Medicine*, April, 1916.

"Every fracture, no matter where located and no matter what the surroundings of the case may be, is a distinct problem," says Eikenbary. The author makes a strong plea in the article for a careful selection of operative or mechanical procedures in the treatment of individual fractures. His tendency is towards conservatism, while making reference to many of the operative procedures. After specifying a few instances in which operative measures are necessary, he outlines a conservative treatment for many other fractures. He maintains that a bone graft is the ideal treatment for ununited fracture, and believes that the Murphy intramedullary splint seems to lack the mechanical exactness of the inlay, and to be less scientific.—*E. A. Rich, Tacoma.*

**AUTOGENOUS BONE-GRAFTS IN NON-UNION AND MALPOSITION OF FRACTURES OF LONG BONES.** W. S. Goldsmith. *Jour. of the Med. Assn. of Georgia*, February, 1916.

The autogenous bone-graft is considered the best treatment for non-union or malposition of fractures of the long bones. Emphasis is laid upon asepsis. Mention is made of the fact that union may take place in spite of infection of graft. He admits 25% failures. He says his best results have been obtained in the femur.—*F. G. Hodgson, Atlanta.*

**NEW METHOD OF FRACTURE FIXATION.** George W. Hawley, *Interstate Med. Jour.*, April, 1916.

Hawley describes a clamp which can be applied to fractures and withdrawn after the wound is closed and the limb encased in plaster. "It can be removed without cutting the cast, disturbing the dressings or exposing the wounds."

The instrument consists of a long slender bar, a loop of heavy woven bronze wire attached to a sliding block, and thumb screw. The loop is designed to encircle the bone and to engage the end of the bar to form a false knot. By tightening the loop, the bones can be held in a powerful grip, and by loosening the loop, can be slipped off easily.

A transverse or oblique fracture can be held by spacing the wires.

The instrument is usually allowed to remain in place a couple of days and is then removed.

The author also describes a modified Lowman clamp, in which the claws are straight rather than claw-like.

The paper is illustrated with drawings of the instruments and with X-ray plates.—*Archer O'Reilly, Saint Louis.*

**FRACTURE RECORDS, A NATIONAL EFFORT TOWARDS STANDARDIZATION.** Thomas W. Huntington. *Northwest Medicine*, April, 1916.

An article designed to reach the various county societies of the Pacific Coast states, in relation to the American Surgical Association's "Schedule of Fractures," and "Inquiry Form for Fractures." The article is prefaced

with a statement that each individual fracture, in its mechanism and primary status, is a widely variable factor in influencing end-results or determining the value of a particular method of treatment.

"It is an aphorism that nearly every fracture embodies a potential loss of function and deformity. Consequently, it is fundamental that analyses of end-results, as related to types of fracture or special methods of treatment, must reckon not only with the bone or bones involved, but with the peculiar mechanism of small groups of each type. This involves a study of the following collateral data:

"1. The personal equation of the patient; age, social and physical condition.

"2. The bone lesion, whether single or multiple, relation to joint structures, direction of fracture lines and coexisting comminutions.

"3. Trauma of soft parts, skin muscles, blood vessels and nerve trunks.

"4. The special method used and, in operative cases, the fixation material employed."—*Edward A. Rich, Tacoma.*

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COMPLETE SEPARATION AND ANTERIOR LUXATION OF THE EPIPHYSIS OF THE LEFT FEMUR. W. S. Kahn. *New York Med. Jour.*, March 8, 1916.

A report of a case of a forward and upward dislocation of the epiphysis of the femur, which the writer could not reduce under narcosis.

A curved incision was made above the patella, the quadriceps tendon cut and the joint opened. The epiphysis was found jammed against the lower end of the femur. The epiphysis was forced back into place and held so by periosteal sutures. A cast was used for six weeks. The result was perfect. The report is illustrated by four X-ray prints.—*A. J. Davidson, Philadelphia.*

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FRACTURE OF THE CAPITELLUM. H. H. McCampbell. *Tenn. State Jour.*, March, 1916.

Case of young man thrown from a motorcycle. Thought to have been due to direct trauma. Closed reduction unsuccessful. Open operation and removal of fragment, which was anterior. Infection unfortunately occurred, delaying healing. Result several months later showed free flexion and rotation, but extension was limited to slightly beyond a right angle.—*R. Wallace Billington, Nashville.*

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THE TECHNIC AND RESULTS OF THE OPEN METHOD OF OPERATION ON BONES AND JOINTS. C. Hugh McKenna. *Jour. A. M. A.*, May 13, 1916.

This article offers nothing new on the subject of bone surgery, merely emphasizing the value of aseptic technic, and favoring the introduction of bone-grafts with periosteum rather than foreign substances, except in cases of marked deformity. The value of open incision, especially in intracapsular hip fractures, and the subject of osteogenesis of bone transplants, are briefly reviewed. Several very good prints of X-rays of various fractures, before and after reduction, accompany the paper.—*Eben W. Fiske, Boston.*

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THE CAUSES OF PROLONGED DISABILITY FROM FRACTURES. S. B. Rosenzweig. *New York Med. Jour.*, April 1, 1916.

A most complete enumeration of the many causes of disability from fractures. Well classified. Treatment is not discussed.—*A. J. Davidson, Philadelphia.*

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TREATING GUNSHOT FRACTURES BY EXTERNAL FIXATION APPARATUS. B. S. Simmonds. *British Medical Journal*, April, 1916.

By means of an aseptic operation, the author plans to insert into the bone suffering from a septic compound fracture, at a distance from the seat of fracture, screws which are long enough to project well beyond the surface of the skin, and to immobilize the fragments by means of a rigid plate fixed to the screws by nuts, the whole operation being done without interfering with the original wound. Two screws are used in each fragment, the screw part entering the bone having a wooden thread, and the projecting part of the screw has a milled thread, for holding the nut. The screws project  $1\frac{1}{2}$  or 2 inches beyond the skin, leaving plenty of clearance for dressings, etc.—*J. J. Nutt, New York.*

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ON THE DIAGNOSIS OF FRACTURES BY PHYSICAL EXAMINATION VERSUS SKIAGRAPHY. P. G. Skillern. *Interstate Med. Jour.*, April, 1916.

Skillern believes that the diagnosis of fractures should be made without the X-ray, and the latter should be used to show whether the reduction is satisfactory, and also to determine any additional fractures which might be overlooked.

He does not believe in useless manipulation, and attempts to elicit "preternatural mobility and crepitus."

The mechanism of the injury should be visualized from the history. The examination should be gentle and the good limb compared with the injured one. If deformity exists, the examination should immediately terminate. If no deformity exists, the limb should be palpated, and if a "wincing" pain is made out, a fracture may be diagnosed.

A fracture should never be reduced without an anesthetic, unless there is some contra-indication.—*Archer O'Reilly, St. Louis.*

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IX. MISCELLANEOUS DISEASES, GENERAL ORTHOPEDIC ARTICLES, PHYSICAL THERAPY, ETC.

PLASTERER'S CORNS AND BUNIONS. G. F. Boehme. *Medical Record*, March 25, 1916.

Boehme calls attention to an occupational ill, occurring as bunions and corns on the hands of plasterers from the use of the mortar-board or "hawk." He has devised an improved "hawk," which is illustrated in the article, and claims that its use will prevent the occurrence of these unsightly and painful calluses and bunions.—*Robert B. Cofield, Cincinnati.*

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CHRONIC BACKACHE. Herman W. Marshall. *Boston Med. and Surg. Jour.*, April 27, 1916.

Marshall, by numerous case reports, gives his classification of the causes of chronic backache.

1. Static back strain, which is characterized by absence of any limitation of motion, no tenderness, prominent abdomen and distribution of pain in shoulders, lower back and legs. No history of injury. Increased lumbar curve. Abdominal support gives relief.

2. Low back strain associated with injury. Have limitation of motion, localized tenderness, muscle spasm, X-ray negative. History of heavy lifting. Back strapping gives relief.

3. Round shoulders. Occurs usually in young anemic children, and in later life leads to permanent changes in the scapulae, which may require operation. Treatment consists in correction of shoulders by exercise and braces. Attention to general tone is very essential. The neurotic element often prominent in adults.

4. Postural shoulder strain, which is due to some vascular defect associated with poor personal hygiene. No history of injury. Treatment is with tonics and strappings.

5. Sacro-iliac strain with permanent lateral and forward list of body. In these cases there is no history of injury but an association with some lateral curvature. There is a rigid lumbar spine, tenderness over the sacro-iliac joint, and the thighs may be spastic. Firm strapping and the use of an abdominal belt may give relief.

6. Fracture of vertebrae. Treatment consists in fixation.

7. Hypertrophic arthritis of spine. This type occurs usually in middle or later life as the result of infections, continued minor mechanical strains or the wear and tear of life.

8. Infectious arthritis. The tonsils, appendix, urethra, etc., may be source of infection.

In discussing anatomic variation as a factor the writer thinks that a muscular weakness from some cause makes a condition possible for the anatomic anomaly to produce the pain, especially with the long transverse processes of the fifth lumbar vertebra.

Considerable stress is placed upon the importance of a lowered general condition to produce a relaxation of the muscles and ligaments, leading to backache.

In regard to sacro-iliac dislocations, Marshall states that appreciable displacement is uncommon, although a microscopic laxity may be frequent with slight strains. Treatment consists in mechanical support, immobilization, correction of deformities, surgical procedures, physical therapeutics, drugs, diet, and hygiene.—*E. B. Mumford, Indianapolis.*

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A PRACTICAL SCHEME TO IMPROVE THE PHYSIQUE OF AMERICANS. E. C. Newton. *Medical Record*, April 15, 1916.

The writer gives a detailed plan for the physical examination and education of school children, whereby defects and deformities may be discovered in early life, while the prospect of easy correction is still feasible; also a proper training in body development and hygiene is elaborately portrayed.—*Robert B. Cofield, Cincinnati.*

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SOME OF THE SURGICAL ASPECTS OF PAINFUL BACK. W. F. Shackleton. *Jour. A. M. A.* May 20, 1916.

Anatomic variation of the transverse process of the fifth lumbar vertebra is an important cause of disability and pain in the back, according to Shackleton. He considers it an acquired condition from hard labor, sometimes from infection, and takes no account of the possibility of congenital malformation. Pain may be mechanically produced by spreading the sacro-iliac or lumbo-sacral joints through pressure on the ilium, by erosion of the ilium and by inflammatory or direct pressure on the lumbo-sacral cord, which lies directly on the sacrum. The literature on the subject with the results of operative interference in the twenty cases previously reported are given, to which the author adds three cases, in two of which the long transverse process was removed, with relief of pain.—*Eben W. Fiske, Boston.*

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## X. WAR SURGERY.

EFFECTS OF WET AND COLD; TRENCH FEET. F. M. Bell. *Canadian Med. Assn. Jour.*, April, 1916.

This condition manifests itself by localized œdema, ecchymosis, and in a

small proportion of cases by areas of superficial gangrene. It is characterized by neurotic pains of a burning nature, and by hypoaesthesia or anaesthesia of the skin of the affected part.

There are three types: the mild, the moderately severe, and the severe.

The exciting cause is the immersion for hours and days in cold semi-liquid mud or water. One of the most important predisposing causes is interference with the circulation of the foot. Puttees have been blamed by many. Although the suffering may be severe, and the oedema cured within a few weeks, nevertheless, even in moderate cases, they are unfitted for duty for two or three months.

Bell remarks on a certain analogy between this and chilblain because of the return of the symptoms upon slight provocation.—*J. J. Nutt, New York.*

WAR ORTHOPEDICS. Hohmann. *Munch. med. Woch.*, Feb. 15, 1916, p. 255.

The author has operated in 58 cases of nerve injury: 14 nerve suture, 38 neurolysis, 6 neurolysis combined with suture. Severely injured nerves, even though not completely severed, may not respond to the faradic current. It may, therefore, be justifiable to wait for spontaneous recovery, though the author favors early operation. Where a reaction of degeneration is present, operation is always indicated, and experience shows that it is best to operate as soon as the external wound is healed. Abstracts of a few cases follow: 1. Suture of median nerve 8 weeks after injury. First signs of returning function 6 weeks later. 2. Suture of median and ulnar nerve 5½ months after injury. Returning function 5 weeks later. 3. Suture and neurolysis of partially severed tibial 6 weeks after injury. Earliest response 2 weeks later. It was thought that the node occurring in the continuity of an injured nerve may consist largely of scar tissue, blocking the path of the growing nerve fibres. These nodes are due to inflammatory reaction, hyperemia, and infiltration of interstitial tissue. Sometimes a second node is found on the nerve just distal to the point of injury. Hohmann, with many others, believes that these secondary spindles are due to a stasis of lymphatic and blood vessels in the nerve sheath, with consequent permanent induration. When there is a complete break in a nerve, even though the ends may have grown together, resection of the scarred area is necessary. The secondary nodes are merely thickenings of the perineurium. In these cases enucleation of the nerve by splitting the perineurium is indicated. The thickened perineurium can often be stripped off like a shell. In these cases, the freed nerve feels soft in its entire course. When, after removal of the perineurium, there is a thickened node in the nerve itself, this portion must be resected. Great care is exercised to avoid tension in cases of nerve suture. Relief of a nerve from surrounding adhesion frequently does away with all pain. Early neurolysis never does harm. The author has employed Foramitti's prepared calves' arteries, as well as free fat and fascia flaps to surround sutured nerve with complete success. He prefers fine catgut to silk for nerve suture.—*F. J. Gaenslen, Milwaukee.*

WAR ORTHOPEDICS. Hohmann. *Munch. med. Woch.*, Feb. 22, 1916, p. 298.

Hohmann reports a successful arthroplasty of ankle for bony ankylosis. The tibial surface was made convex below, and the astragalus correspondingly concave. A flap of the gastrocnemius was interposed. Result, 30 degrees dorsal flexion, 30 degrees plantar flexion. The case is a recent one, but the author regards it as very promising.—*F. J. Gaenslen, Milwaukee.*

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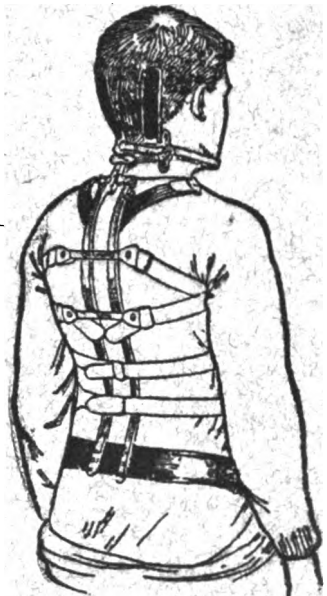
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# *The American Journal of Orthopedic Surgery*

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## THE OPPORTUNITY FOR THE ORTHOPEDIST IN PREVENTIVE MEDICINE THROUGH EDUCATIONAL WORK ON POSTURE.

BY JOEL E. GOLDTHWAIT, M.D., F.A.C.S., BOSTON.

THE following paper is presented in the belief that the orthopedist has a much larger place in the work of preventive medicine than is commonly held, and that the educational opportunities which exist today offer most attractive lines of work.

It is becoming increasingly more evident that in the control of chronic disease the orthopedist has a very definite place. The lungs cannot be properly developed unless the body is so poised, with the thorax raised, that the proper space exists for the respiratory movement, and this is of equal importance in many of the cardiac diseases. The abdominal organs cannot work rightly unless the poise of the body is such that the proper space exists for the organs, and there are the proper muscular supports. The pelvic organs cannot perform their best function unless the posture is such that the abdominal organs are held in the abdomen and do not crowd downward into the pelvis or upon the pelvic organs or their blood vessels. The circulation in the brain and in the spinal cord can hardly be normal unless the curves of the spine are such that the blood can flow in and out of the skull without difficulty.

To understand such matters and to see that the proper ideals are obtained requires training such as the orthopedist receives, and while the entire treatment of many of the chronic diseases naturally does not fall to him, nevertheless, his place is a very important one. If the stomach is working badly special diets and medicine may be indicated, but the use of proper mechanical measures may make the other measures more efficacious. If sugar or albumin is present in the urine, special diets or medicine may be indicated, but by changing the poise of the body at the same time so that the organs can work without mechanical interference, the cure is effected with much greater ease.

After the special disease has developed, the place of the orthopedist seems to be recognized, as is shown by the prominence given the orthopedist upon the staff of several of our well-known hospitals and sana-



toria for chronic diseases, but the appreciation of the even greater opportunity which exists in overcoming the tendencies to these diseases through educational work in our schools and colleges, by teaching the individuals the proper use and development of the body, is not so fully recognized. Judging from the work on "lordotic or orthostatic albuminuria," or from some of the work on glycosuria, or in some of the derangements of the stomach and bowel, as well as many of the pelvic disturbances, the conditions can be understood only by the appreciation of the mechanical adjustment of the organs. Many of these conditions are due to the imperfect adjustment due to faulty posture, and this being the case, naturally the time to correct such conditions is in childhood, before the vicious or undesirable habits have been formed. In the school or on the playground, as well as in the home, the orthopedist has his place, in seeing that the body is so developed that good health is possible. That this is being appreciated is evidenced by the demands for posture talks and lectures, as well as for instructors in our schools and colleges.

As a distinctly significant sign of the awakening is the fact that the type of person who is being demanded for these positions is not the physical trainer type, but rather individuals trained to understand the body as a whole, with the proper appreciation of posture in all its phases as an influence upon the physiology and the general development.

To keep people well is the first function of the health officer, but since the best health is not possible unless the body is used rightly, the place of the orthopedist is evident.

That this is not a proper part of our work is felt by some, and certainly it is a fact that most of the work of our specialty of late has been devoted to the treating of disease once it is established, rather than prevention. That this other work exists, there can be no question, and that it was long ago considered part of our work is perhaps best shown by referring to the writings of the man who gave us the name under which we work and who was the author of the first work on orthopedics.

In 1741, M. André published his work entitled *Orthopaedia*, and the first section opens as follows:

"As to the title, I have formed it of two Greek words, viz. *ὀρθός*, which signifies straight, free from Deformity, and *παιδίον*, a Child. Out of these two Words I have compounded that of *Orthopaedia*, to express in one Term the Design I propose, which is to teach the different Methods of preventing and correcting the Deformities of Children."

A little farther on, in speaking of the "Plan of *Orthopaedia*," the following appears:

"It is not only allowable to take care of the Gracefulness of the Body, but this Care, while it is confirmed within certain Bounds which Reason prescribes, and which everybody is well acquainted with, ought to be enjoined. We are born for one another, and ought to shun having anything about us that is shocking; and even though a Person should be left alone in the World, he ought not to neglect his Body so as to let it become ugly; for this would be contradicting the Intention of the Creator. This is the Principle upon which our Orthopaedia is founded." (p. 36.)

"When the Spine is strait, well set, and finely turned, it makes a handsome Body; and when it is crooked and ill turned, the Body is deformed." (p. 77.)

To show how early the educational work should begin in order to prevent disease or deformity is shown from his lengthy reference to the earlier work on Paedotrophia, "Manner of bringing up and nourishing young children," and from the following paragraph from his own book:

"What we have already remarked, may serve as a Caution to Mothers when they swaddle their Infants, by no means to Bind their Shoulders too tight; for this makes the Clavicles more crooked than they should be, and hence the upper part of the Chest is contracted.

"For the same reason, when Children are in Gowns, they ought to be so made that the Openings of the Sleeves may allow them sufficient Liberty to turn the Arms outwards. And, as soon as they are a little grown up, they should have a Stick of a proper length to hold by the two Extremities with their Arms stretched out. This small Effort, if it is frequently repeated, will not fail to make the Clavicles long and flat.

"Besides, they ought to make their Children thrust forward the Chest, and accustom them to use this Exercise frequently. The Motion which they make to accomplish this will push their Arms backwards, and by a necessary Consequence, will lengthen the Clavicles." (p. 81.)

That he knew much about posture and saw the importance of right carriage to health, with definite ideas of treatment, is shown by:

"A high Chest, for Example, provided it is not raised above a certain Point, has a fine Effect upon the Eye. A Chest, on the contrary, that is flat and depressed, looks very disagreeable; besides that this Figure is not so commodious, neither for Health nor long Life." (p. 79.)

"Shoes that are too high heeled will make the Bodies of Children crooked, and for this Reason they should go without them, especially Girls, till they are five Years old." (p. 85.)

"To prevent the Bellies of Children from advancing too much forwards, you must hinder them from sitting crooked upon their Seats, and oblige them to sit upright."

"The same Method must be used for keeping their Back straight; for if they sit with their Body bent, the Back must be crooked and round." (p. 83.)

"Young Girls ought not to be allowed to sew or read, except in an erect Posture; they should hold their Work or their Book to their Eyes, and not their Eyes to their Work or Book, without which their Body will infallibly become crooked." (p. 86.)

That proper seating and desk form is not new is shown by:

"It is usual to give Children, when they are taken from the Nurse, small Elbow-Chairs, made of Straw or Rushes, which have all a Hollow in the Bottom, because they cannot be made otherwise. Thus they place the Children upon these little Chairs, by which means their Bodies begin to grow deformed, by little and little, in their tender Years." (p. 84.)

"Most part of Children have their Bodies made crooked in learning to write, because People are not at the pains to give them a Table high enough for the purpose; which is a thing that ought to be taken very good care of." (p. 86.)

That the bed positions were not overlooked is shown by:

"Not to let Children sleep upon high Bolsters, or to allow them none at all, is another means for preserving the bodies of Children streight, or setting them to rights again when they begin to grow crooked." (p. 86.)

The thoroughness of his attention to detail in preventing disease and deformity is shown in:

"When Children are recovering from a Disease that has confined them long to their Bed, the use of stitched Stays, or at least of quilted Bodice, is more necessary than upon any other occasion; because the Body being weakened by the length of the Disease, will very easily acquire an ill Shape. Nay, grown Persons themselves ought, in such a case, to remember the Precaution." (p. 88.)

That the anatomic understanding of the body form with the different type characteristics is the basis of our work, there is, of course, no question, and it is interesting to note that this was appreciated by André, who speaks of the varying types as follows:

"The Ears are either broad or narrow, large, or of a middle size, jutting out or lying flat upon the Head, or closely attached to it.

"The Neck is either long or short, thick or slender.

"The Breast is either broad or narrow, flat or rising.

"The Shoulders are either strait behind or crooked; Broad or narrow.

"The Waist is either thick and clumsy, or slender and delicate; short or long.

"The Haunches are either too much raised, or depressed.

"The Backside is either protuberant or the contrary.

"The Legs are either slender or thick, long or short, or of a middle length. Here we must remark that when the Neck is long, the Legs and Ears are long likewise.

"The Feet are either long or short, thick or slender; broad in the instep or narrow, or between the two.

"There is not one of those different Conformations, as well as of the Head as of the other parts of the Body, that does not bear a necessary proportion to the rest of the parts. If, for example, the Waist is thick and short, the same Shape will obtain in the other parts of the Body; the Arms will be short and thick, the Hands broad and clumsy, and the Fingers thick and short. A Person that has a Waist long and slender will have the Limbs long and thin. And one whose Waist is of a middle size will have the Limbs so too." (p. 71.)

When it is realized that three-fourths of this early writing is devoted to discussion of that which has to do with the prevention of deformity, and therefore disease, and that by deformity he chiefly considered that which we class as postural, we certainly have all the justification that is necessary for emphasizing this phase of our work.

That the proper construction of the costume is a part of our work, we have only to go back to André, and in this it is interesting to note that for the covering of the feet he not only considered the shape and height of the heels of the shoes, but that he also used the elevation of one side, which we now designate as the Thomas heel.

That this is a part of our work there can be no question, nor can there be any question but what the best health of the individual exists only when the body is used rightly. The time to stop the functionally weak back is in childhood, by teaching the child how to use its spine. The time to prevent pulmonary disease is in childhood, through training that the body will be so developed that the lungs can be used rightly and gain the strength with which to throw off disease. That the time to correct visceroptosis, or the symptoms which are commonly designated as this, is in childhood, when the body can be so trained that the postural habits of weakness which lead to the harmful displacement cannot develop. To secure the best efficiency of the individual, in spirit, mind and body, the training should begin in childhood, before the harmful weaknesses have developed. To direct such work involves the appreciation of the anatomic form for the special types, the appreciation of the mechanistic elements which favor or interfere with the posture of the special part, and for that reason orthopedic training is almost essential

for the direction of such work. In this there is a great opportunity for the orthopedist in doing that which represents the best kind of "Preventive Medicine" work. Such work naturally has its greatest opportunity in the childhood periods, through work in the schools, but it also concerns the adult, and especially in the industrial or occupational conditions.

Such work also has for an incentive the fact that if it is rightly carried out, it must mean that the boys and girls who are growing up will come to adult life with bodies equal, not only to the work of the world, but so developed that their children will be stronger and healthier than we have any reason to expect unless this orthopedic early training is given. This, it seems to me, as it did to André, is the really greatest opportunity for us as orthopedists, in that it not only helps the individual, but that the generation that is to come after must be stronger and better for our guidance.

#### DISCUSSION.

DR. FREIBERG: I have been very much interested in hearing this paper. Here is ground on which we can easily come together. Here we can remind ourselves of the old ideal, "*Mens sana in corpore sano.*" This work will exert a great influence on the future citizen, and here there is no room for divergence of opinion. This work is upon the line we can all follow with enthusiasm, but we have been sitting down on the job. I can lend the work my very highest endorsement.

DR. TRUSLOW: The question, it seems to me, is how much care will we personally be willing to give, and how much time are we willing to spend towards helping the patient. I believe it is up to the orthopedic surgeon personally to undertake this physical care of the patient so far as it is in his power to do so. The relation of any physician to the community is a very important one, and the work of the Posture League, in its advisory nature, is the right thing. We should all be willing to lend a hand and undertake this kind of educational work. If we don't know how, we should learn. If exercises or clothing and planning of occupations and posture will help the patient, we should be the ones to undertake to supervise this work.

DR. SAYRE: I only wish I shared the optimism of Dr. Freiberg. I agree that it is ground on which we can all meet. André said that prevention was a large part of the work of the orthopedic surgeon. But there is a difference in pointing out the right shape of chairs and getting the world to adopt it. I don't believe we shall get people to follow our advice. We have never been able to get shoemakers to make sensible shoes, and fashion has been much more influential in getting women to shed their corsets and alter their dress, than common sense.

DR. TWINCH: In Newark, New Jersey, the medical inspector of schools has taken up the subject of preventive medicine, and has a staff of nurses and physicians. The gymnasium instructors supervise the work done in the school gymnasiums. The school orthopedic clinic is a distributing station. Children who have deformities which need operative or instrumental treatment are referred to the Orthopedic Hospital. Cases of slight postural deformities are sent to the school gymnasiums. Cases of severe congenital entropoptosis are treated by exercise at the school clinic, under a specially trained instructor.

DR. FREIBERG: The question of suitable seats and desks for children in schools has interested me for a long time. I visited a number of schools in Cincinnati, and had certain tasks given to the children by their teachers, so as to make my presence noticed as little as possible. I then photographed the children, and I was surprised to learn how difficult it was for even well-meaning teachers to use the adjustable desks. Photographs showed that children sat upon these seats in the worst possible postures. There is no easily adjustable furniture at present in use which the teacher can adapt to the needs of the school children in a satisfactory way.

DR. RIDLON: Mr. President, I think the first thing which the Association can do, which will have a practical bearing on this subject, is to discard the use of high, stiff collars.

DR. TAYLOR: We owe a distinct debt to Dr. Goldthwait for quoting these striking passages from André, who seems to have been a keen observer, and to have had much good sense. The book was published in French, and almost at once translated into German and English,—a most unusual occurrence at that time,—so that it must have attracted wide attention. We have come to exactly the same conclusion as Dr. Freiberg in regard to school furniture. None of the adjustable school furniture we saw was satisfactory. The League Furniture Committee would accept no adjustment requiring the use of a wrench. No desk, however, will compel perfect posture; in addition to proper furniture we need posture training; we should provide the children with good seats and then show them how to sit.

DR. GOLDTHWAIT: I was delighted to hear Dr. Ridlon say what he did. We should be the ones to show people the way to do things by our example. Dr. Grenfell was speaking the other day of an occurrence in the war zone. He was talking to a group of officers, and they saw a man coming towards them from a distance. One of the officers said, "That man must be a medical man. No trained man would walk like that." Sure enough, when the man arrived it was Dr. ———. That shows the need of example by the medical profession. Another thing Dr. Sayre may be encouraged to hear. The students of Smith College are instructed in the proper use of the body, and must take a certain course of hygiene upon the structural form of the body. They are not allowed to graduate without satisfactorily passing this course. I feel that these women, going to homes and as the mothers of future children, will have an enormous influence with this fundamental instruction. Men's colleges are not as far along, but there are some signs of awakening there. When the colleges once set the standards, the schools will follow.

## THE TREATMENT OF CARIES OF THE SPINE BY BONE TRANSPLANTS. A REPORT OF TWENTY-THREE CASES.

BY RUTHERFORD L. JOHN, M.D., PHILADELPHIA.

WITHIN the past four years a lively interest has been awakened in the treatment of tuberculosis of the spine by operative interference, due to the splendid results reported by Albee from the use of bone transplants. The operation has been urged as a means of hastening more rapid formation of a firm bony ankylosis of the affected vertebrae, thus shortening the duration of the treatment, with a reduction in the resulting deformity.

In an endeavor to ascertain how far these results have been obtained in the patients treated, a collection was made of twenty-three cases operated upon in the services of Dr. A. P. C. Ashhurst at the Episcopal and Orthopedic Hospitals of Philadelphia, between the years 1912 and 1916.

Of these 23 cases, one was operated on in 1912, six cases in 1913, nine cases in 1914, and seven cases in 1915. The patients ranged in age from two to 29 years.

The results obtained have been classed as "excellent" where there is an apparent arrest of the disease, firm bony ankylosis, no pain and an improvement in the patient's general condition. The results are "moderately good" in those cases where pain has been relieved, where ankylosis is fairly well established, but where, for one reason or another, the patients are still under hospital supervision. The "poor" results are in those patients who have shown no improvement or have retrogressed since the operation, being under hospital care constantly.

RESULTS.	NO. CASES.	PER CENT.
Excellent .....	7	.35
Moderately good .....	3	.15
Poor .....	1	.05
Indifferent as to operation.....	8	.40
Died as result of operation.....	1	.05
Not traced or too recent to consider.....	3	

Combining the "excellent" and the "moderately good" results as those benefited by the operation, there is a total of 50% of patients improved.

Of the six cases which died under treatment, one patient died of acute military tuberculosis in forty days after operation; one, of ether pneumonia in forty hours after operation; three patients died of tuberculous meningitis in 17 days, two months, and three months respectively; and one case of secondary sinus infection 26 months after operation.

In seven cases the dorsal region was involved, the dorso-lumbar region in 10, the lumbar in four, and the lumbo-sacral region in two cases.

A study of the following condensed case histories again emphasizes the fact that this operation should not be performed on a patient under five years of age. Of the six deaths occurring in this series, five cases were under five years of age, the sixth case being just five.

Moreover, the question of the efficacy of the operation, in any but the most carefully selected cases, suggests itself. As a rule, the patients who have benefited from the operation were those who were seen and operated upon a few weeks or months after the symptoms were first noted. As part of the operative treatment, they were put to bed, with extension, fresh air and forced feeding, and later wore a plaster jacket, followed by a brace, for a year or more. Certainly we have all seen incipient tuberculous cases in which, under such treatment, and without an operation, as firm an ankylosis of the diseased vertebrae was secured as in any of these operative cases.

The danger of arousing and disseminating a more or less latent infection by the trauma of the operation is more grave than has been generally conceded. Even in those cases where the operation has been most successful in ankylosing the vertebrae, the good results in several instances have been only local, the disease soon appearing in a new focus. (See Cases 2, 4 and 7.) In other words, the disease is arrested locally, but not generally.

CASE 1. C. R., age 2 years. Dorsal region involved. Condition first noted six months before admission. Treated in the hospital for two months by rest in bed before operation on September 23, 1912. Patient died forty hours after operation of ether pneumonia.

*End-Result.* Patient died from the effects of the anesthetic.

CASE 2. E. N., age 3½ years. Lumbar region involved. Trouble first noted six weeks before admission. Treated in the hospital by Buck's extension from March 24, 1913, until operation on April 30, 1913. Patient discharged wearing a Taylor brace, but developed a psoas abscess after being about on her feet for a year, and died of exhaustion from sinuses with secondary infection in June, 1915.

*End-Result.* Indifferent as to operation. Patient died after two years of progressive disease.

CASE 3. J. S., age 4 years. Dorsal region involved. Trouble first noticed three months before admission. Treated in the hospital for three years with plaster jackets until operation on June 19, 1913. Patient wore a Taylor brace for one year after operation. When last



heard from, in April, 1916, was in excellent condition and had not worn a brace for over a year.

*End-Result.* Excellent.

CASE 4. A. H., age 4 years. Dorso-lumbar region involved. Kyphosis noticed one year before admission. Patient had never walked. Treated in the hospital on Bradford frame and Buck's extension for four months before operation on August 13, 1913. Sent to Atlantic City wearing a Taylor brace and able to walk. Was readmitted to the hospital in January, 1915, and again in April, 1915, with symptoms of advancing tuberculous disease.

*End-Result.* Indifferent as to operation.

CASE 5. J. S., age 10. Lumbar region involved. Trouble began by a fall from a third-story window seven years before admission. Operation performed on August 21, 1913. Mother reports in March, 1915, that patient is going without support, has no pain, is active and eats well. Ankylosis firm.

*End-Result.* Excellent.

CASE 6. M. F., age 24. Lumbar region involved. Patient was struck by a trolley car five months before admission. Treated in the hospital by Buck's extension for twenty-two days before operation on August 22, 1913. Wore a Taylor brace for one year after operation, after which he was able to do his work as a carpenter until January 11, 1916, when he was readmitted to the hospital with a discharging sinus at the lower end of the kyphosis. Patient states that he was well until he fell and struck his back, two weeks before admission. A Wassermann test at this time showed a positive +4 reaction. Patient was put on mercury and iodides and later given an intravenous injection of neosalvarsan. The sinus rapidly healed and patient again is able to do his regular work as a carpenter.

*End-Result.* Excellent.

CASE 7. M. F., age 4. Dorso-lumbar region involved. Trouble began two years before admission. Treated in the hospital for two and a half months before operation on August 27, 1913. Sent to Atlantic City, wearing a Taylor brace. In 1915 was reported in a home for incurables with a kyphosis some distance above that of the operation. Her general condition is fair.

*End-Result.* Moderately good.

CASE 8. E. C., age 4 years. Dorso-lumbar region involved. Kyphosis first noticed eighteen months before admission. Treated in the hospital

for six weeks before operation on June 27, 1914. Discharged wearing a Taylor brace and readmitted March 9, 1915, with symptoms of advancing disease. After a short stay in the hospital was discharged in good condition. In January, 1916, X-ray shows bone transplant still firmly anchored in spinous processes of six vertebrae. Kyphosis has, nevertheless, increased, since, to about the same deformity as before. However, the patient wears no brace, and is free from symptoms.

*End-Result.* Indifferent.

CASE 9. J. S., age 4 years. Dorso-lumbar region involved. Trouble began three months before admission. Treated in the hospital for one month before operation on June 18, 1914. Patient died on August 4, 1914, in the hospital, of tuberculous meningitis.

*End-Result.* Indifferent as to operation.

(NOTE.—On July 30, 1914, a piece of protruding bone was cut from the upper end of the transplant. The stump of the transplant bled, showing vascularization of the transplant to the point of removal in forty-two days.

CASE 10. E. C., age 4½ years. Dorsal region involved. Has had kyphosis with intermittent attacks of paraplegia for one year before admission. Treated in the hospital for two months before operation on May 20, 1914. Discharged wearing a Taylor brace and when last heard of, in February, 1916, was in good condition. Patient not wearing brace.

*End-Result.* Excellent.

CASE 11. J. G., age 3 years. Dorso-lumbar region involved. Kyphosis noticed one year before admission. Treated in the hospital on Bradford frame and Buck's extension for two months before operation on July 23, 1914. Patient was in the hospital for nine months after operation, and was then sent to Atlantic City (wearing a Taylor brace), where he is still in a sanatorium.

*End-Result.* Moderately good.

CASE 12. E. McB., age 4 years. Lumbo-sacral region involved. Patient had had previous treatment for a tuberculous wrist, which had cleared up before admission for spinal symptoms of one month's duration. Treated in the hospital on a Bradford frame and Buck's extension for two months before operation on September 30, 1914. Discharged wearing a Taylor brace, and when last seen, in January, 1916, was in excellent health and had not worn the brace since June, 1915. Ankylosis was firm.

*End-Result.* Excellent.

CASE 13. J. W., age 17 years. Lumbar region involved. Condition began one year before admission. Treated by rest in bed and plaster jackets for seven months before operation on October 31, 1914. A cold abscess was found at operation between spinous processes. Patient has worn a Taylor brace ever since operation and has received constant attention for a discharging sinus at the lower end of the wound. Patient's general condition is poor.

*End-Result.* Poor.

CASE 14. J. O., age 3 years. Dorsal region involved. Trouble began six months before admission. Treated in the hospital by Buck's extension for three months before operation on October 31, 1914. Patient discharged in good condition, and when last heard of, in May, 1916, ankylosis was firm, but patient showed moderate grade of spasticity of both lower extremities with markedly increased reflexes.

*End-Result.* Moderately good.

CASE 15. R. W., age 3 years. Dorsal region involved. Trouble began eighteen months before admission. Treated in the hospital on a Bradford frame and Buck's extension for two months before operation, on November 4, 1914. When last heard of, in December, 1914, patient was doing well.

*End-Result.* Not traced.

CASE 16. M. L., age 2 years. Dorso-lumbar region involved. Treated in the hospital on a Bradford frame and Buck's extension for two months before operation on November 18, 1914. Discharged wearing a Taylor brace, and died at home in February, 1915, of tuberculous meningitis.

*End-Result.* Indifferent as to operation.

CASE 17. H. S., age 3 years. Dorsal region involved. Kyphosis first noticed six months before admission. Treated in the hospital for seven weeks before operation on January 27, 1915. Temperature remained high after operation and condition gradually grew worse, the child dying on March 9, 1915, of acute miliary tuberculosis.

*End-Result.* Indifferent.

CASE 18. E. U., age 13 years. Dorso-lumbar region involved. Pain began two weeks before admission. Treated in the hospital for one month by Buck's extension before operation on February 17, 1915. Discharged wearing a brace, and when last seen, in February, 1916, was in excellent condition, ankylosis firm, no pain, and gaining in weight.

*End-Result.* Excellent.

CASE 19. N. B., age 5 years. Dorsal region involved. Trouble began two years before admission. Treated in the hospital by Buck's extension for six weeks before operation on April 28, 1915. Patient grew rapidly worse and died of tuberculous meningitis on May 15, 1915. Wound was found healed when cast was removed after death.

*End-Result.* Indifferent as to operation,

CASE 20. S. N., age 24 years. Dorso-lumbar region involved. Trouble began two months before admission. Treated in the hospital by Bradford frame and Buck's extension for two weeks before operation on May 7, 1915. Discharged wearing brace, and when last heard from, in June, 1916, was in good condition. Ankylosis was firm, but the lower end of the transplant is unduly prominent. Has not worn his brace for three months, and has gone back to his work as a carpenter.

*End-Result.* Excellent.

CASE 21. J. M., age 29. Lumbo-sacral region involved. Fifteen months before admission patient had right breast removed for carcinoma. Eight months ago had some glands removed from the left axilla, which were diagnosed by the laboratory as carcinoma and tuberculosis. Complained of pain in lumbo-sacral region for four weeks before operation on May 29, 1915. Wound sloughed after operation and condition grew worse until, on December 14, 1915, the graft was caught at the exposed lower end with forceps and pulled out *in toto*. The wound has healed slowly since then but the patient is confined to bed and growing more cachectic daily. Recurrent carcinomatous growths on chest are held in check by X-ray treatments.

*End-Result.* Indifferent as to operation.

CASE 22. S. S., age 2 years. Dorso-lumbar region involved. Kyphosis first noticed four weeks before admission. Treated in the hospital on Buck's extension and Bradford frame for four months before operation on October 20, 1915. Patient is now wearing a Taylor brace and is up and about ward, but psoas abscess present before operation shows no tendency to be absorbed.

*End-Result.* Too recent to consider.

CASE 23. H. McG., age 29 years. Dorso-lumbar region involved. Pain first noticed two years before admission. Treated in the hospital for three weeks before operation on October 27, 1915. Patient discharged wearing a Taylor brace, and is at present in good physical condition.

*End-Result.* Too recent to consider.

## OBSTETRICAL PARALYSIS—AN ORTHOPEDIC PROBLEM.

BY JAMES WARREN SEVER, M.D., BOSTON.

FOR many years, in fact it might be said always, up to the present, Obstetrical Paralysis or Birth Palsy has been considered a neurological condition, to be treated by the neurologist alone. It is now proper, I believe, for the orthopedic surgeon to add his bit to the treatment of this condition, in view of the disabilities and contractures so universally seen in these cases which are so essentially in his field, and which neurological treatment can neither prevent nor correct.

It is for this purpose that this subject is brought before you in this new light, for practically all of these cases can be helped greatly and improved by the application of adequate orthopedic methods, in conjunction with neurological advice.

Obstetrical paralysis was first described by Smellie<sup>1</sup> in 1768, but was brought forcibly to the attention of the medical profession in 1872 by Duchenne, who described four cases.

The condition is a paralysis produced during birth, and is due to an injury to the nerves of the brachial plexus. The resultant paralysis is characteristic. The arm hangs limp at the side, the elbow extended, the forearm pronated, and the whole arm inwardly rotated. The paralysis is usually flaccid.

A study of literature on the subject shows that practically all observers have agreed that the paralysis is due to injury to the brachial plexus, due to forcible separation of the head and shoulder, and resulting in a tear to a greater or less extent of some of the cords of the brachial plexus. This has been confirmed both by autopsy on cases and by experiment.

Erb showed, in 1874, that the so-called "Prague grip," used during delivery of the after-coming head, where the fingers were hooked above the shoulders, was an adequate cause in certain cases of the injury.

Stransky<sup>1</sup> reviews the whole literature of the subject up to 1902, and the majority of the authors cited agree in the main that force, pressure, and too energetic traction, produce the injury. Other writers, namely, Robinson,<sup>2</sup> J. J. Thomas,<sup>3</sup> Warrington and Jones,<sup>4</sup> Bullard,<sup>5</sup> Taylor,<sup>6</sup> Osterhaus,<sup>7</sup> Bailey,<sup>8</sup> Fairbanks,<sup>9</sup> Peltsohn,<sup>10</sup> Gordon,<sup>11</sup> Platt,<sup>12</sup> Darling,<sup>13</sup> and Sharpe<sup>14</sup> all accept the traction theory.

T. T. Thomas<sup>15</sup> has fallen back on the old Lange theory that the injury to the plexus is secondary to an injury to the joint capsule at birth and that the paralysis is due to an exudate which surrounds and compresses the plexus. This theory is pure philosophy, and has no bearing either in clinical findings or experimental evidence.

The following table shows the authors who have reported cases:

TABLE I.—SHOWING AUTHORS WHO HAVE REPORTED CASES, GIVING THE DATES OF THEIR REPORTS AND NUMBER OF CASES REPORTED.

AUTHOR.	DATE.	NUMBER OF CASES REPORTED.
Duchenne .....	1872	4
Nadaud .....	1872	3
Erb .....	1874	2
Ducouneau .....	1876	2
Seeligmuller .....	1877-1882	8
Roulland .....	1884	1
Thorburn .....	1886	1
Arens .....	1889	1
Henoch .....	1890	1
Danchez .....	1891	4
Budin, cited by Danchez.....		1
Rabinski .....		1
Monnier .....		2
Burr .....	1892	8
Lovett .....	1892	9
D'Astros .....	1892	1
Bailly and Onimus, cited by D'Astros		1
Comby, cited by D'Astros .....		1
Carter .....	1893	16
Hochstexer .....	1893	1
Well .....	1896	1
Fleux .....	1896-7	2
Jolly .....	1896-7	3
Gullemot .....	1896	12
Walton .....	1896	2
Haynes .....	1897	3
Warrington and Jones .....	1896	2
Cibert .....	1897	2
Plauchu .....	1898	1
Shoemaker .....	1899	2
Haslinger .....	1899	2
Bollenhagen .....	1899	2
Robinson .....	1899	17
Steiner .....	1900	1
Thomas, H. M.....	1900	3
Maygrier .....	1901	1
Stolper .....	1901	1
Peter, cited by Stransky .....	1902	2
Oppenheim, cited by Stransky .....	1902	1
Koster, cited by Stransky .....	1902	4
Schultze, cited by Stransky .....	1902	1
Thomas, J. J. ....	1905	2
Bullard .....	1907 (43 in detail)	178
Murphy .....	1907	1
Taylor, A. S. ....	1908	10
Osterhaus .....	1908	2
Rhode .....	1909	1
Frauenthal .....	1912	4
Fairbank .....	1913	40
Lange .....	1913	17
Thomas, T. T. ....	1913	9
Peltesohn .....	1914	5

AUTHOR.	DATE.	NUMBER OF CASES REPORTED.
Gaugele .....	1914	4
Gordon .....	1914	1
Van Neck .....	1914	3
Platt .....	1915	5
Sharpe .....	1916	56

Total number of reported cases to date..... 457

Fifty-eight authors.

Total number of cases reported in this paper, 471.

#### PATHOLOGY.

There are generally two well recognized types of paralysis seen. The more common consists of a lesion which involves the fifth and sixth cervical roots and the suprascapular nerve, and produces a paralysis of only the muscles of the upper arm, with the exception of the supinators.

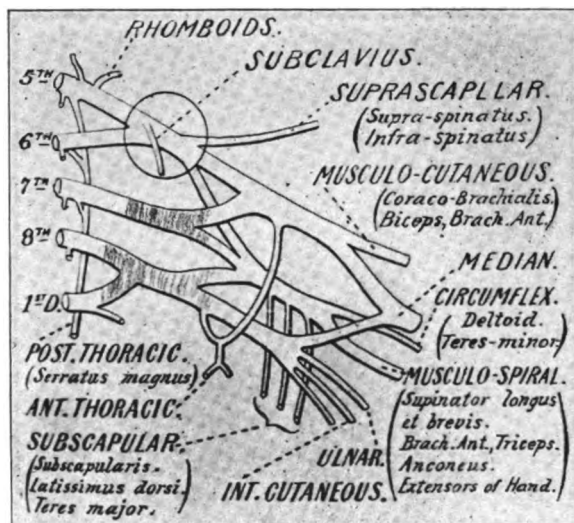


FIG. 1.—Shaded areas represent injuries to plexus causing lower arm paralysis. Circle represents site of injury in upper arm types.

This type is known as the "upper arm type." The less usual type, the so-called "lower arm" or "whole arm type" is result of injury to not only the fifth and sixth cervical roots, but the seventh and eighth, and possibly the first thoracic as well. Here the whole arm is flaccid, there is a wrist drop and paralysis of the small muscles of the hand. There occurs also, rarely, the pure lower arm type of paralysis, without any involvement of the upper cords of the plexus, the so-called "Klumpke's"

paralysis, several cases having been reported by J. J. Thomas, Jolly, Guillemot, Seeligmuller, Thorburn, Raymond, Comby, Danchez (see Stransky<sup>1</sup>). These cases show a paralysis, usually the result of stretching of the plexus from over-extension of the head in cases of face presentation, and due to injury to the lower cords of the plexus, namely the seventh and eighth cervical and first dorsal roots. They may at times be bilateral. It is in this type that one often sees inequality of the pupils, owing to the fact that the sympathetic fibres from the deep cervical ganglionic plexus enter the spinal cord through the first dorsal and at times through the eighth cervical roots. Injury, therefore, to these roots, leads to an unopposed action of the motor oculi nerve.

Pathologically in the milder cases the stretching or tearing force results in a greater or less degree of hemorrhage or edema into the nerve sheaths. In others there may be a rupture of the perineural sheath, accompanied by hemorrhage into the substance of the nerve trunk, associated with a tearing apart or a separation of the nerve fibres. This latter condition leads, of course, to permanent impairment of function and the formation of scar tissue in the nerve tract. In the more severe cases of the upper arm type there is a partial or complete division of the fifth and sixth cervical roots, which leads to a more permanent form of paralysis than usual, and the formation of a more extensive area of scar tissue.

#### AUTHOR'S EXPERIMENTS.\*

The author, by numerous dissections on infantile cadavers, has shown that traction and forcible separation of the head and shoulder puts the upper cords, the fifth and sixth cervical roots of the brachial plexus, under dangerous tension. This tension is so great that the two upper cords stand out like violin strings. Any sudden force applied with the head bent to the side and the shoulder held, would without question injure these cords. Further observation shows that forcible abduction and elevation of the arm and shoulder put the lower cords of the plexus, the eighth cervical and first thoracic, on a stretch, and when much force is applied it may well lead to a tear, rupture or other injury to these segments. This condition is seen in breech cases, with arm extended. It may also follow sudden strain when the arm is elevated, such as the so-called "hostler's" paralysis, caused by the sudden elevation and strain of the arm, which occurs when a hostler holds a rearing horse.

\* Work done in the Laboratory of Surgical Pathology, Harvard Medical School, by courtesy of Dr. E. H. Nichols, director.



With the shoulder held and the head carried to one side, with the clavicle intact, considerable force was necessary to injure the plexus. The suprascapular nerve always snapped first, apparently for the reason that it had not so much freedom of play as the others. Even with considerable force, the fifth and sixth nerves could not be completely torn across at Erb's joint, but frayed out inside the sheath, following a partial tearing or rupture of the sheath, which always gave way first. In some cases there could be produced an evulsion from the spinal cord of the fifth and sixth roots.

With the clavicle removed, the whole weight of the shoulder came practically directly on the plexus, and less force had to be exerted to cause an injury, which under these conditions was generally greater in extent, but presented the same general characteristics. It was most difficult to put the eighth cervical and first thoracic roots on a stretch unless the arm was abducted or hyperextended with great force. With the clavicle intact, there was apparently always enough room, even with the arm elevated and hyperextended forcibly, between the clavicle and plexus, so that direct pressure from the intact clavicle on the plexus did not seem a possible cause of the paralytic condition. A fractured clavicle, of course, allows the weight of the shoulder to drag on the plexus and so predisposes to greater injury from traction. Rotation of the head, combined with forcible abduction, apparently does not increase the degree of tension greatly, certainly not enough to cause additional damage. In no case, even with all the force I could apply with my hands, could I rupture the joint capsule or even separate the humeral epiphysis. Neither could I dislocate the head of the humerus. The clavicle can be broken without great force, but fractures of other bones which go to make up the shoulder joint are practically impossible. Most birth fractures occur in the clavicle, or in the humerus at about the junction of its upper and middle third. Stone<sup>16</sup> states in the experimental work which he did that the humeral epiphysis could be easily separated, but I failed to confirm this.

At birth the shaft of the humerus is nearly wholly ossified, but the two extremities are cartilaginous. The scapula at birth is largely osseous, with the exception of the glenoid fossa, the coracoid and acromial process, and the posterior border and inferior angle, which are still cartilaginous. It is on account of these conditions that fractures in these regions, at birth, are practically non-existent. It is not possible to produce a paralysis of the Erb type by the fracture of any bone but the clavicle.

In order to get a clear idea as to what happened to an exudate from

a ruptured capsular ligament of the shoulder, in studying Lange's theory, I injected the shoulder joints of several infants with methylene blue, and then caused a rupture of the anterior portions of the joint capsule. The infants were then allowed to lie in a preserving solution, on their backs, for several weeks, following which time a dissection was made. In no case did the methylene blue go above the clavicle, but completely surrounded and invaded the plexus in the axilla. This would in life lead to a paralysis of the whole arm at and below the joint, but would in no way affect the nerves above the clavicle, and in no case would there be the typical picture of obstetrical paralysis, *i.e.*, paralysis of fifth and sixth cervical. As I have before stated, why the exudate should leave the nerve alone in immediate proximity of the capsule and seek out Erb's point, the junction of the fifth and sixth cervical segments, at least two or three inches above the clavicle, Lange, Thomas and others have not made quite clear. It evidently does not happen. Why also should the suprascapular nerve always be involved, which generally arises from the fifth cervical, at about Erb's point? One thing impressed me, and that was the evident vulnerability of the upper cords of the plexus under any degree of traction, in view of which it is surprising that the paralysis was not of much more frequent occurrence.

**X-RAY FINDINGS.** One hundred and nine of the recently observed 170 cases of obstetrical paralysis have had X-rays taken of both shoulders on one plate. These cases have varied in age from two days to eighteen years. In two cases only had there been fractures, one of the clavicle and one of the upper third of the humerus. Both had healed without incident.

A study of the X-rays taken in these cases shows the following condition:

In the first year there is usually nothing seen of bony deformity. There may be a slight posterior subluxation of the shoulder joint, but there is never any acromial deformity evident by X-ray or clinically. No case has been observed where the epiphysis has been displaced as far as could be seen by comparison with the normal shoulder. The epiphysis, as well as the shaft of the humerus, is always smaller than the unaffected side, which condition is undoubtedly due to atrophy from disuse.

The scapula is practically always elevated and outwardly rotated, due apparently to the pull of the intact inward rotators and the levator anguli scapulae.

As time goes on and the child gets older one begins to see increasing

evidence of bony deformity, occasionally more joint subluxation than at first, increasing outward displacement and elevation of the scapula and acromial deformity. The deformity of the acromion consists of a bending downward and forward, or hooking of its outer end, which apparently having no bony resistance to meet as normally in the head of the humerus, projects downward in front of the subluxated and inwardly rotated head. This hooking seems to vary directly with the degree of posterior subluxation and inward rotation of the humerus, and tends to increase as the child gets older, provided subluxation is present.

No case has been observed where there has been a total subluxation or dislocation of the shoulder joint backward. The clavicle usually is shorter and its curves are more acute than its normal fellow.

**CLINICAL FINDINGS.** When the child is first seen, if within a few days or weeks after birth, the following picture is classical of the upper arm type, of which there were 400 in this series. The arm lies limp at the side, extended, and is inwardly rotated, with complete inability to abduct, elevate, outwardly rotate or supinate. The muscles paralyzed in the typical upper arm type are as follows: Deltoid, supraspinatus, infraspinatus, teres minor, biceps and supinator longus, and occasionally the serratus magnus, coraco-brachialis and supinator brevis. The arm cannot be actively flexed at the elbow, but as a rule the lower arm is not affected so far as flexion and extension of the wrist and flexion and extension of the fingers goes.

The inability to raise or abduct the arm at the shoulder is due to the paralysis of the deltoid and supraspinatus; outward rotation cannot be accomplished because of the paralysis of the infraspinatus and teres minor, and the arm cannot be internally rotated owing to the internal rotators, namely the teres major, the subscapularis and latissimus dorsi, being already fully contracted, due to lack of opposition.

The arm cannot be flexed at the elbow owing to the paralysis or weakness of the biceps, brachialis anticus, coraco-brachialis and supinator longus, and supination cannot be carried out, owing partially to the inward rotation in which the arm is held, and the weakness or paralysis of the biceps and supinator longus or brevis.

In regard to sensation, it may be stated that it has been impossible in the early cases to determine any changes from the normal on account of the age of the patient. Likewise, electrical reactions have not been carried out, for this examination would mean anesthesia, which did not seem justifiable in such young children, when one already had all necessary data.

During the first week in the early cases the child may cry if the arm is handled or moved, especially in abduction, but this soon disappears. In one or two cases there has been some swelling and tenderness noted by palpation over the plexus, above the clavicle. This condition, however, apparently had no connection with the degree of paralysis present. The hand grip is usually good and the child flexes and extends the wrist and fingers well. The later developments in the upper arm cases, as the child grows and gets older, with or without exercises and massage, are as follows: the persistence of the inward rotation and adduction deformity; the so-called "policeman's tip" position; the inability in most cases to supinate fully or freely; the inability to get the hand to the mouth, without raising the elbow, due to inability to outwardly rotate; the inability to put the hand to the head or behind the back.

In the lower arm type all these conditions hold, besides the additional ones due to the paralytic conditions of the lower arm and hand, resulting generally in a useless dangle arm.

**ATROPHY** of the muscles in these cases of obstetrical paralysis is never very marked except in some cases of the lower arm type. One never sees the extreme atrophy so noticeable in cases of infantile paralysis. This lack of marked atrophy is undoubtedly due to the fact that the nerve impulses are rarely fully blocked, and that the muscles practically never, except in rare cases, wholly lose their entire innervations. Some normal nerve impulses pass through the scar tissue at the site of the lesion, owing to incomplete destruction or injury of the nerve, and so keep the muscle tone up to a certain point. There is always a definite shortening of the arm in all cases, however, due probably as much to nerve injury as lack of use.

**WHOLE ARM TYPE—LOWER ARM TYPE.** There were seen 64 cases of this type in this present series. In this classification those cases were placed which showed any nerve involvement beyond that usually shown by an injury of the fifth and sixth cervical roots. These cases represented then injuries mainly to the whole of the plexus, or at least the seventh and eighth cervical and first dorsal roots. Pupillary inequality and narrowing of the palpebral fissure were not unusual with this type. Wrist drop was the usual condition associated with the usual inability to supinate and the additional inability to extend the lower arm. Paralysis of the flexors and extensors and flexors of the fingers was common, associated with paralysis and atrophy of the intrinsic muscles of the hand. Often the proximal phalanges are hyperextended, and the distal ones flexed, due to the paralysis of the inter-

ossi or lumbricales muscles. There is, of course, no power to grip, and the fingers cannot be moved. There usually is ulnar displacement or adduction of the hand. These cases, almost without exception, represent severe tearing injuries to the roots of the plexus, and although some of the muscles may recover in part, particularly the upper arm and shoulder groups, the lower arm ones practically never recover, even after attempted operative repair of the plexus. It is in these cases that sensation is more apt to be impaired than in the usual upper arm type.

A not uncommon type seen is one showing simply a wrist drop, associated with the usual picture of upper arm paralysis or evidence of injury to the fifth, sixth and seventh cervical roots. These cases, as far as results go, really should be classed with the simple upper arm type. Two cases have been recorded where the two lower roots alone have been involved. These have been reported fully by J. J. Thomas.<sup>3</sup>

TABLE II.

Boys .....	235	Right .....	272	Upper .....	400
Girls .....	236	Left .....	186	Lower .....	64
	<hr/>				
	471				
Both Arms.....	9	{ Upper 2 Lower 1		6 not reported.	
Labor:					
Difficult .....	418				
Ether .....	363				
Forceps .....	317				
Normal .....	32				
Asphyxia .....	102				
Presentation:					
Head, including face.....	219				
Breech, including foot and version.....	66				
Position not known.....	186				
	<hr/>				
Total .....	471				
Fracture, clavicle .....	14				
Arm broken .....	3				
Cord around neck and arm.....	2				
Cord around neck.....	2				
Pupils unequal .....	16				

An analysis of Table II may be of interest. In the first place there is no reason to expect any difference in regard to the sex, unless one is ready to accept Simpson's theory that girls' heads, being smaller and so not dilating the canal sufficiently, would subject them to a more difficult labor, and so to a greater per cent. of occurrence of injury to the brachial plexus. These figures, representing by far the largest

number of cases so far reported, and outnumbering all others reported by all observers, do not confirm his theory.

The right arm was affected 272 times and the left 186, about 68% in favor of the right arm. This bears out Sharpe's figures in his series of 56 operative cases. Nine cases had both arms affected.

The types of paralysis differed, the most usual one being the so-called upper arm type, 400 being recorded, as against the so-called lower or whole arm type, where besides the fifth and sixth cervical cords being injured, the seventh cervical, eighth cervical and first dorsal are injured. Of this type 64 cases were recorded. In nine cases which had both arms affected the lower or whole arm type of paralysis predominated.

It has been conceded by practically all authors that a difficult labor was a predisposing factor in the causation of paralysis. In this series 418 cases were definitely recorded as long, laborious and difficult; 363 at least had ether and 317 had forceps used; 32 were apparently normal labors and 102 were recorded where the child was asphyxiated. All the conditions noted above imply the application of force combined with great muscular relaxation of the child, conditions peculiarly favorable for the production of such an injury. A moderately large number, it is recorded, had the head delivered naturally but the "shoulder stuck," at which time force was applied.

In regard to the presentations, 219 at least were vertex or face presentations and 66 were breech, the latter classification included versions and footlings. In 186 the position was not recorded, but a large majority of these was probably vertex. These figures do not bear out either Tubby or Sherren (quoted under Fairbank<sup>b</sup>), who state that the paralysis occurs equally in head or breech presentations. Fairbank's own figures refute this also, for he reported in 40 cases 32 vertex cases and 7 breech. These figures cover 285 cases of the author's where the presentation was definitely known.

The other conditions occurring at birth may be noted in the table, and I want to add a word about only one of them, namely, that of unequal pupils. This condition is probably overlooked in some cases, and is a most important symptom, in that it means, through injury to the cervical sympathetic, definite injury to the plexus either of the lower cords, the eighth cervical or first dorsal, which have communicating bands with the cervical sympathetic or injury in the spinal cord itself, to the fibres of the sympathetic system. The prognosis in these cases is usually not as good as in those which do not show this sign.

**TREATMENT.** The treatment of these cases at once resolves itself into two divisions, *i.e.*, those to be treated with massage and exercises, principally those of the upper arm type, and those to be treated by operation on the plexus, usually those of the lower arm type. Unless the early treatment has been adequate, the upper arm type will also come to operation, not for plexus repair, but to correct contraction deformities. This operation, which has been devised by the author, will be spoken of later.

At first, in order to prevent contraction of unparalyzed muscles, it seems best to put the arm at rest in a position where such muscles cannot become contracted. This may be done by holding the arm in a plaster cast, or by the use of a light wire splint, in an abducted, elevated and outwardly rotated position, with the hand supinated. This position can be maintained, between massage and gymnastic treatments, and insures a better subsequent position of the arm. It also takes the drag off the paralyzed muscles, allowing them to regain their strength more quickly and prevents subsequent shoulder joint deformity, such as subluxation and acromial hooking and overgrowth.

Massage and exercises are of the greatest importance and should be done daily if possible. It is most unwise to allow a child to become obsessed with the idea that it has an arm which cannot be used. Exercises which have been described in detail by J. J. Thomas<sup>3</sup> are most satisfactory, and have been developed during the past twenty years in the Neurological Department of the Children's Hospital. The treatment should be continued for several years at least, and if contractures develop in the subscapularis and pectoralis major, they must be divided before any further range of action in the arm is to be hoped for.

In regard to the operation on the plexus in the usual upper arm type of case it might be said that in the experience of this clinic it has not been found necessary. In the lower arm type of cases the situation is quite different. Also it cannot be too strongly emphasized that no operation on the plexus will be of any great use in restoring functional activity to the arm, unless contracted and restricting muscles are divided, and careful after-treatment persisted in for a long period.

In regard to the operative treatment on the plexus in the lower arm type of case, it may be stated that this has been done a number of times without any real benefit. The plexus in all cases was found to be so badly torn, and so bound down and invaded by scar tissue that any kind of repair was impossible. In spite of the work done by A. S. Taylor,<sup>6</sup> Stone,<sup>16</sup> Fairbank<sup>9</sup> and others, there has been no case as yet which has shown an anatomic or physiologic cure or even a marked

improvement. This may be due to the facts that in the first place the plexus was impossible to repair; and secondly, granted that the plexus repair was in part possible, the muscular contractures and joint deformities were not recognized or properly treated, without which the plexus repair would be a waste of time and effort.

The following operation was devised following suggestions made by Fairbank.<sup>9</sup> It differs from Fairbank's operation in that the shoulder joint is not opened, as he does in his operation. Opening the shoulder joint leads to adhesions of the capsule which are troublesome and fatal to the best functional results. Also I have found that complete division of the pectoralis major is always advisable, in that it is practically always tightly contracted, and so holds the arm adducted and prevents abduction and outward rotation. The subscapular tendon can usually be easily found with the arm abducted and outwardly rotated after the division of the pectoralis major, and be divided without opening the joint capsule.

**OPERATION.** An incision is made, situated on the anterior aspect of the arm and extending from the clavico-acromial joint to a point below the lower edge of the pectoralis major tendon. The incision is carried down between the deltoid and clavicular portion of the pectoralis major, tying or retracting the cephalic vein. The tendon of the pectoralis major is isolated and divided on a director. Turning the cut pectoral back and retracting the deltoid gives a good view of the long head of the biceps and the joint capsule, as well as the short head of the biceps and coraco-brachialis. The arm is now abducted and outwardly rotated, bringing into view the transverse fibres of the tendon of the subscapularis, at its point of insertion into the joint capsule, at its inner and anterior aspect. This tendon is isolated, and a sound or other blunt instrument is passed under it and it is then divided. In this way not only is the pectoral divided, which when contracted prevents abduction, but also the subscapularis is divided, which when contracted prevents outward rotation. It is better to divide the subscapularis by this method rather than to open the joint capsule after Fairbank's method, for it does not lead to subsequent adhesions of the capsule to the joint cartilage and consequent loss of motion.

After these two structures have been cut, outward rotation and abduction will usually be found to be perfectly free. In case either is at all restricted, the coraco-brachialis or the short head of the biceps may be found to be tight, and partial division of these structures will always lead to full freedom in outward rotation and abduction. If the head of the humerus is blocked by the hooking downward of the acromion in front



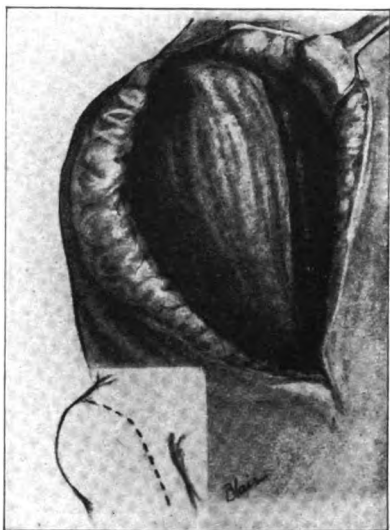


FIG. 2.—Shows skin incision and incision between deltoid and pectoral.



FIG. 3.—Shows pectoral cut and deltoid and pectoral retracted. Long head of biceps in floor of wound.

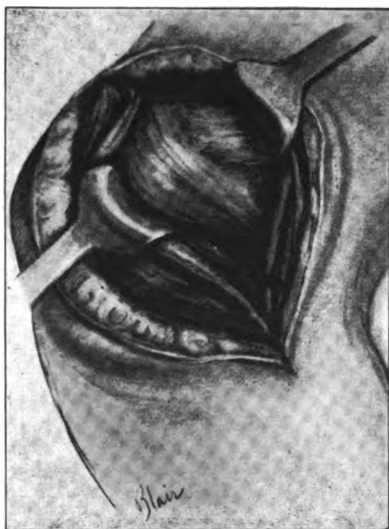


FIG. 4.—Shows joint capsule with insertion of subscapular tendon on inner aspect.



FIG. 5.—Note sound passed under tendon of subscapularis. Arm abducted and rotated out to its limit.

of it, so that the posterior subluxation cannot be fully reduced, an osteotomy can be easily done, on the acromion through the upper end of the original incision. If there is an anterior subluxation of the joint, as occurs rarely, the pectoralis is the only muscle which needs to be divided, as a division of the subscapularis would only tend to increase a deformity already present. The pectoral and deltoid are then joined with interrupted catgut sutures and the skin closed by a continuous catgut suture. The arm is then put into a plaster cast extending from the crest of the ilium to the tips of the fingers, the arm being abducted, elevated and outwardly rotated and the hand supinated. This cast should be worn only about two weeks, at the end of which time baking, massage and exercises should be started and continued daily for several months. After two or three weeks a wire splint, which holds the arm in the same position, may be substituted for the cast, in that it is lighter and more comfortable.

**RESULT OF OPERATION.** About 20 cases so far have been operated on. The first few were done by Fairbank's method, and were kept in plaster the length of time advised by him, namely three months. It is too long. Although they were improved, it has required persistent effort and considerable difficulty to restore motion in the shoulder joint, besides muscle strength, and the results were not commensurate with the time and effort expended.

Recently, since I have been doing the operation described, combined with early treatment, that is, beginning massage, manipulation and exercises at the end of two weeks, the results have been much better. This is what might have been expected. Once the contractures are divided, long fixation is obviously unnecessary.

**PROGNOSIS.** The prognosis in all upper arm type of cases is good, provided the case is watched from the start and the treatment properly carried out. They are practically all able to raise the arm to the shoulder level and can use the hand and lower arm well except for varying degrees of supination. Abduction and outward rotation are rarely regained without division of the contracted muscles, provided they have been allowed to contract.

In the lower arm type the outlook is not as good, although many of the cases regain use of the upper arm in spite of the persistent paralysis of the lower arm and hand. These cases should all be explored for repair of the plexus as far as possible, but even then very little hope can or should be held out to the parents. The general principles of treatment should, however, be carried out over a long period of time. Much can be done along orthopedic lines for these cases, and they should not be gen-

erally neglected, as they have been in the past, with the statement that nothing can be done, or that they will get well of themselves.

#### CONCLUSIONS.

Obstetrical paralysis is due to a stretching or tearing of the cervical roots of the brachial plexus. It occurs in boys as frequently as in girls. It occurs more often on the right than on the left.

The upper arm type is much more frequent than the lower arm type.

It affects both arms very infrequently.

It is practically always associated with a difficult labor, where ether or forceps have been used, and where force has been applied. Not uncommonly is the baby asphyxiated. Head presentation shows the largest percentage of occurrences of both types of cases.

It may be rarely associated with fracture of the clavicle, but is not the result of a fractured humerus, or a dislocated shoulder joint.

The prognosis for a useful arm is good in the upper arm type and bad in the lower arm type.

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## DISCUSSION.

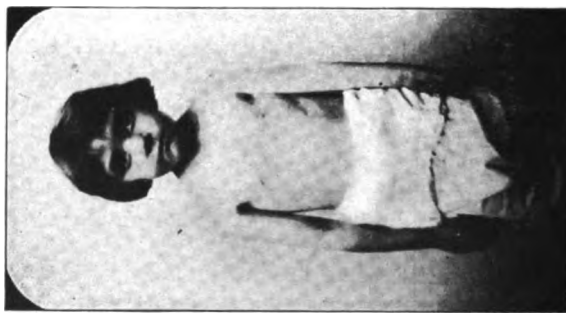
DR. DAVIS: I believe in these cases injury may be to two structures,—the nerve injury and the articular injury. The injury to the nerve is rarely treated, and in a comparatively short space of time it is recovered from. The articular injury causes cicatrization with the arm in the position in which it is left,—there is a wrist drop, adduction and internal fixation of the shoulder and pronation of the hand, with slight flexion of the elbow. When the healing takes place within a few weeks after birth, the arm is then fixed, and when the child tries to use it it is prevented by the cicatrization. Our treatment then should be directed towards putting the arm in a normal position. The mother should be taught to stretch persistently the arm, to raise it up and supinate it. Conservative treatment in these cases should be to put the arm in plaster, with felt wedged in behind until you can get the arm back and out and up. Only a small percentage of cases should be operated on. During the past year I have operated to increase the supination of the wrist, but these are secondary operations to increase the range of motion. Often I have succeeded in twisting the arm out by dividing the muscles. Where there is a limitation of abduction, if the arm is raised the scapula swings right around. In operative cases I have divided the subscapularis and pectoralis major, and even carried the incision behind the head of the humerus so as to allow abduction. I strongly believe that there is a great field for conservative treatment in these cases.

DR. PORTER: I would like to endorse what Dr. Davis has said. I don't know whether Dr. Sever intended to convey the impression that all cases should be operated on sooner or later, but I believe, with Dr. Davis, that seven-tenths of the cases will show regeneration. The factors to be remembered are these,—it takes a long time for the nerve to regenerate, and by three or four years of age the child acquires the habit of mental exclusion of the affected arm. I have seen cases where the arms were not paralyzed, but the child mentally excluded the arm. This child must be taken very early, as soon as the mother notices that it does not move the arm, and the arm should be forcibly abducted and supinated every day. In time, perfect use of the arm will result. If this is done I don't think many cases will require operation.

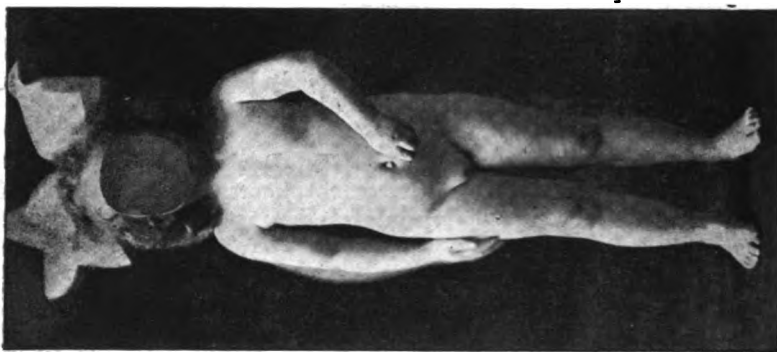
DR. ROGERS: I heartily endorse the work that Dr. Sever has done, and I would like to show the results of correction of this deformity by means of an osteotomy of the humerus. This method has been described in the German text-books, but is very little known in this country. The first case was operated upon in 1913, and this photograph was taken in 1915. I cannot show the condition before operation, but it presented the typical deformity. The second case was operated in 1915, and this photograph was taken eight months later.

The operation consists of an open osteotomy just below the shoulder joint; then the lower fragment is rotated outward to correct the inward rotation. The arm is put up in plaster of Paris extended until union takes place.

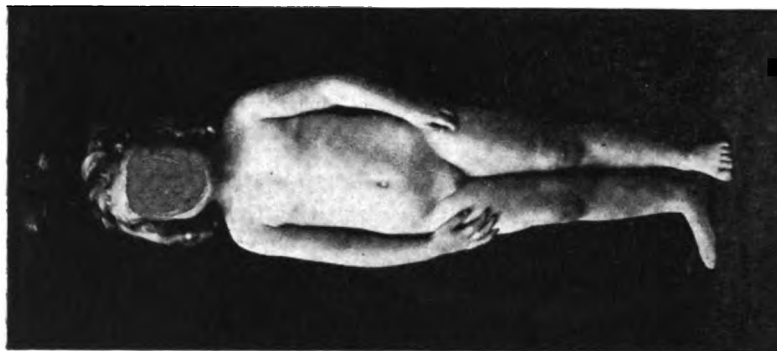
The effect of this method is the correction of the deformity, and the plac-



CASE No 1. After operation.



CASE No. 2. Before operation.  
Osteotomy of humerus, to correct deformity.



CASE No. 2. After operation.

ing of the hand in such a position that it can be used. It does not change the motions of the shoulder joint, nor make any attempt at reduction of the dislocation. It seems to me that this method is of distinct value in the older cases, in which it is not possible to correct the position of the shoulder joint. It is a simple method, and is of advantage in such cases as cannot have long-continued after-care.

DR. OSGOOD: I think the contentions of Dr. Davis and Dr. Porter are sound, but we still have many club-feet to correct which have not been treated successfully, and we shall, doubtless, continue to see unsuccessfully treated cases of obstetrical paralysis. I have been treating a case of a child of ten, who has had one and a half year's work on a deformity of the shoulder and arm without any particular result. Dr. Sever was good enough to operate on this case, and in two months there has been a really marvellous result,—the power of the deltoid has come back and the child can raise the arm. In cases where permanent contractions exist, I am a convert to the method of Dr. Sever.

DR. SAYRE: It seems to me rational to attack the trouble at its point of origin, and you must relieve contracted tendons in order to give the muscles a chance to act. I did not get from Dr. Sever's paper the impression that he advocated operating on all cases. He spoke of using a splint after operation, and also in early cases, to prevent contraction, as in cases of anterior poliomyelitis, holding the child's hand in the required position for a long time. This might prevent operation. I agree with Drs. Davis and Porter that cases should be seen at birth, and that then the endeavor to prevent contractions should be made, but, if in spite of your endeavors you get contractions, the intelligent place to attack this deformity is to separate the contracted points.

DR. PRINCE: In the treatment of birth palsy I think it is important not to overlook the cases demanding early operation upon the plexus. There can be no discussion as to the hopelessness of treating an arm when the nerve roots are torn across or completely blocked by scar tissue. In the cases which are not seriously injured, the rate of recovery is relatively rapid, and after six months their chief handicap comes from the deformity which Dr. Sever has so well described, and for which I believe the operation suggested is most satisfactory.

It has seemed to me in a given case, if recovery progresses for a month or two and then seems to stop, an exploration of the brachial plexus should be advised. In the cases so explored I have found three out of four in which the fifth and sixth cervical roots were torn across and separated. In the fourth, the fifth nerve was constricted in scar tissue until only the sheath remained. Three of these cases were about six months old, and I had watched posterior dislocation develop during that time. The fourth was operated on at the age of two months, and the dislocation could be recognized as beginning. In none of these cases was the suprascapular nerve torn, the injury being below that. The subscapular muscle, through its innervation from the seventh, is probably the most potent factor in the production of dislocation.

In an adult, where the fifth, sixth and seventh roots had been torn across, there was complete paralysis of the subscapular, as well as of the spinati, and no dislocation resulted.

The child operated on at two months of age died four weeks later of pneumonia, without reference to the operation. The other three, without any after-treatment, have regained power in the deltoid, and are getting very satisfactory recovery from their paralysis. They are, however, all more or less handicapped by the rotation deformity, and I believe that all should now have the operation described by Dr. Sever. I shall do this in the course of the next few months. The operation is easy, and the results that I have seen have been eminently satisfactory.

DR. RIELY: I think Dr. Sever's operation a very good one, where the nerve has been torn. Several years ago I had a case in which I was anxious to avoid an operation. I first saw the child when three weeks old; it had what looked to be a typical obstetrical paralysis; the shoulder joint looked to be dislocated also. I reduced the shoulder in extended position in plaster with the arm extended from the side in extreme abduction. The child gained perfect use of the arm and hand, though the shoulder drops a little. Recently I had a case which looked to be a typical obstetrical paralysis and dislocated shoulder. I reduced the shoulder, put it up in plaster in the Albee position, keeping it so for three weeks, at the end of which time it had entirely recovered.

DR. NATHAN: Since I heard Dr. Sever read his paper I am surprised that we did not think of this operation before. In some cases it is impossible to overcome short muscles, unless they are severed. Even when we can secure regeneration by operations on the nerve, the function is sometimes not restored because of the condition of the abductors. I am glad to have heard Dr. Sever.

DR. SILVER: The operative procedure suggested by Dr. Sever appears to be based upon sound principles, and will certainly play a large part in the treatment of such cases in the future. As regards conservative measures, it seems to me that we frequently fail because we do not secure extreme over-correction, and this applies particularly to the limitation of rotation. I wish to emphasize that in order to overcome this limitation of rotation the position in which the arm is fixed must be such that the forearm (the elbow being flexed to a right angle) forms an acute angle with the vertical axis of the body, opening backwards, of considerable degree.

DR. STARR: I agree with Drs. Porter and Davis in their early treatment of these cases. I desire to report, however, one unfortunate case, which illustrates the necessity of very careful handling of these small babes. The child was about four weeks of age, and after stretching of the pectorals, the arm was put up in the abducted position, with the forearm supinated. It remained in plaster in this position for two weeks, and at the end of that time the plaster was removed, and the patient turned over to the masseuse for treatment. The patient returned to the clinic the next week with inability to

use the arm, and on examination a fracture of the surgical neck of the humerus was found. This demonstrates the enormous atrophy which takes place and the ease with which a fracture may happen under these conditions.

DR. WILSON: Like a good many other good things from Boston, this paper will have to be digested before we can realize its importance. Dr. Sever has formed his estimate in 400 cases, and I would like to ask him as to the proportion of cases which have restoration of external rotation. Dr. Starr has given us an illustration of possible cause of injury, but I should like to get an idea of the restoration of muscle function. It appeared considerable, but I should like to know how much is restored.

DR. WHITBECK: There is always restoration of backward rotation, and that is decidedly benefited by the operation of Dr. Sever. I believe the exception is with the brachial plexus. I believe the restoration of torn fibres should be supplemented and the combination of both operations should be tried. There is marked improvement following suture of the torn nerves.

DR. SEVER: In regard to Dr. Davis' remark about nerve injury, I have seen cases from time to time, varying from one day to two weeks, and I cannot see any injury of the bones. It has been possible to demonstrate in all cases that the injury was to the plexus. I don't agree in regard to the position of the arm. The arm should be put up in elevation, abduction, outward rotation and supination. This will put the muscles in a position of physiological rest. Dr. Rogers spoke of osteotomy of the humerus. This will restore complete supination, but it does not attack the original deformity; it simply corrects supination. It leads also to angular deformity. I think it would be better to put the arm at the side, rotate it outward and supinate the hand, to get the support of the thoracic wall. It might be done in a limited number of cases, but not all the time. I believe the treatment in the past has been neurological, rather than orthopedic. Some cases have contractions of the pectoralis major and the subscapular. You cannot control the excursions of the scapular, and stretching has no effect. If the cases are treated early enough, later operations on these muscles will not be needed. The injury is one due to rupturing of the sheath and rupturing of the arterioles supported by the sheath. As the sheath degenerates you get the infolding of the nerves. In more cases of the upper and lower arm type there is a certain amount of nerve fibre left, which allows action of the muscles, provided they are put in the physiological position. So far as I know, there has been no attempt made to put these muscles in this position, of balance; then you can expect better results and can prevent deformities. Dr. Sayre spoke of fixation, and Dr. Porter spoke of mental exclusion of the limb in children. In regard to the latter, the child may be trained in a very short time to use the arm readily. On account of this mental exclusion, the case will persist unless efforts are made to train the child.

In the analysis of 400 cases, all cases show some nerve regeneration, and nothing is gained by early plexus operation. It does not seem good to operate on upper arm types of plexus involvement. There has been no case reported cured as the result of brachial plexus operation.



OBSERVATIONS ON THE PRESENCE OF ROENTGENOLOGICAL SHADOWS ASSOCIATED WITH SUBDELTOID BUR-SITIS; ALSO ON THE PRESENCE OF SIMILAR SHADOWS IN OTHER PARTS OF THE BODY.

BY JOHN MCWILLIAMS BERRY, M.D.,

Clinical Professor of Orthopedics and Roentgenology, Albany Medical College.

Numerous cases of clinically diagnosed subdeltoid bursitis have been reported in which a Roentgen-ray examination showed a definite shadow or multiple shadows in the region of the subdeltoid bursa. These shadows have been interpreted in various ways. It has been suggested that they are due to thickening of the walls of the bursa (Painter); to scar tissue (Baer); to fluid under pressure, a hemorrhage (Beltz); and to a deposition of calcium salts (Painter, Codman, Brickner, Ely and others).

Quite a number of cases have been operated upon and a definite calcium deposit found, but there is a difference of opinion as to the situation of the deposit. Painter, Stieda, Ely, Montgomery and others report the finding of the deposit in the bursa or in the wall of the bursa. Codman, Wrede and Brickner find the deposit beneath the bursa in the tendon of the supraspinatus or infraspinatus muscle, and Dunlop reports a case in which stereoscopic roentgenograms show the calcareous deposit to be in the body of the supraspinatus muscle as well as in the tendon. Dunlop's findings are not confirmed by operation.

Painter was the first to publish roentgenograms showing shadows in the subdeltoid region in cases of subdeltoid bursitis. In four cases operated upon by him he reported the finding of a calcareous deposit in the bursa in two cases; and because he could not find any deposit in the other two cases, he assumed that the shadow in the roentgenogram was due to thickening of the bursal sac. Painter did not confirm his assumption by the subsequent use of the X-ray.

Codman was present at one of Painter's operations where a deposit was found; and it seemed to him that, in that case, the deposit came from beneath the bursa. He reports three operative cases of his own in which he found the deposit beneath the bursa.

Brickner, who has recently written an excellent article on the subject of subacromial bursitis, reports one hundred cases, nineteen of which showed a shadow on the roentgenogram in the subdeltoid region. He operated upon seven of the cases that showed a shadow, and reports the finding of a calcareous deposit in the tendon of the supraspinatus or infraspinatus muscle in all seven of the cases. He found that the de-

posit had no sac or limiting membrane, and after the removal of the calcareous deposit a roentgenogram of the subdeltoid region showed that the shadow had disappeared. Brickner believes that, "As the result of contusion or tear of the tendon, there is a formation of granulation tissue, necrosis of tendon substance and deposition of lime." He also believes that in the two cases where Painter found calcium deposit it was really beneath the bursa, and in the two cases where he did not find it he would have found it had he gone beneath the bursa.

In a recently published article, Montgomery takes exception to Brickner's belief that the deposit is always in the supraspinatus or infraspinatus tendon, and reports a case in which it was found in the upper wall of the bursa.

Several observers (Stieda, Beltz, Haenesch) have noted that in certain cases of subdeltoid bursitis, although a roentgenogram may show a shadow similar to that in cases proved by operation to be due to calcareous deposit, this same shadow may disappear under treatment by rest, hot applications, etc. Following is a brief abstract of the history of four cases in which the writer has had the opportunity of observing that a shadow suggestive of calcareous deposit may disappear under simple treatment.



FIG. 1.

The arrow points to a shadow resembling that of a calculus in the region of the subdeltoid bursa.

CASE 1. Adult female. Following an injury,—a fall on the right shoulder,—symptoms of subdeltoid bursitis developed. A roentgenogram showed a small shadow like that of a calculus in the region of the subdeltoid bursa (Fig. 1). The symptoms cleared up promptly under rest; and a roentgenogram taken fourteen months later showed that the supposed calculus had disappeared.

CASE 2. A young man injured his right shoulder playing football. The patient was examined several weeks after the injury and a diagnosis of subdeltoid bursitis was made. A roentgenogram of the shoulder showed a small shadow in the region of the subdeltoid bursa resembling the shadow of a calculus similar to Fig. 1. The patient was instructed to keep his right arm in a sling, and apply hot packs to the shoulder. Twenty-five days later the symptoms had practically all disappeared; and a roentgenogram showed that the shadow in the region of the subdeltoid bursa had likewise disappeared.

CASE 3. Adult male. Patient developed symptoms typical of subdeltoid bursitis of the right shoulder, without known previous injury. A roentgenogram of the shoulder showed a pronounced shadow in the region of the subdeltoid bursa that resembled a large calculus (Fig. 2,

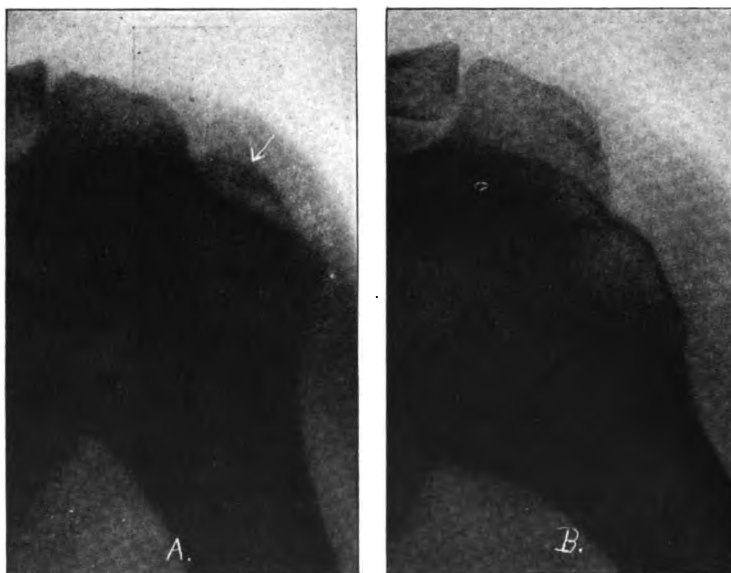


FIG. 2.—CASE 3.

(A) The arrow points to a shadow resembling that of a large calculus in the region of the subdeltoid bursa.

(B) The same shoulder five months later; the shadow in the subdeltoid region has disappeared.

A). Motions of the arm and shoulder were restricted, and in a few weeks the symptoms cleared up. A roentgenogram taken five months later showed that the shadow in the region of the subdeltoid bursa had disappeared (Fig. 2, B).

CASE 4. Adult male. Patient developed pain and stiffness in the right shoulder without known trauma. On examination, a diagnosis of subdeltoid bursitis was made, and a roentgenogram showed a diffuse, dense shadow in the region of the subdeltoid bursa (Fig. 3, A). Hot packs were applied to the shoulder, and eleven days later, the symptoms having cleared up, a second roentgenogram was taken, which showed that the shadow in the region of the subdeltoid bursa had practically disappeared (Fig. 3, B).

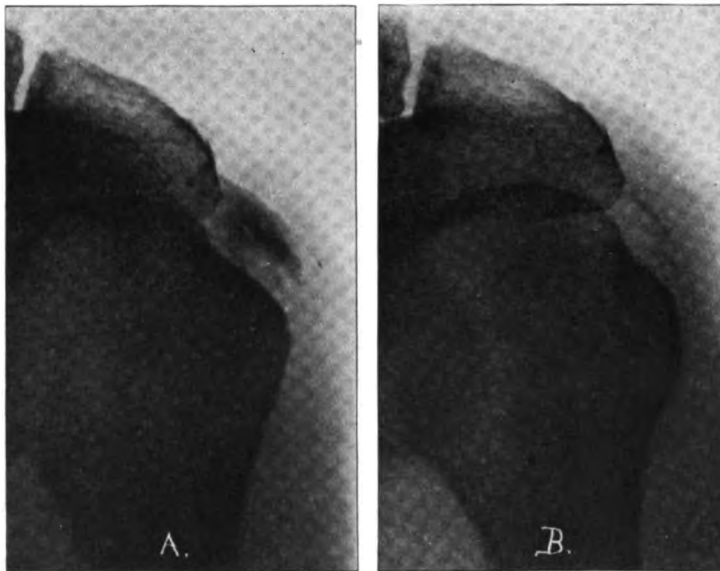


FIG. 3.—CASE 4.

(A) The arrow points to a diffuse shadow in the region of the subdeltoid bursa.

(B) The same shoulder eleven days later; the shadow in the subdeltoid region has practically disappeared.

Apparently, the shadows found in the above reported cases and in the cases reported by Stiede, Beltz, and Haenesch differ in no essential from the shadows found in cases proved by operation to be due to calcareous deposit. It is an interesting phenomenon that a calcareous deposit should occur in the subdeltoid region, following a slight trauma, or in some cases, no trauma at all; also that the deposit should occur so quickly, only five days after the injury in one of Brickner's cases. A

still more interesting phenomenon is the fact that apparently a calcareous material having once been deposited, can be quickly reabsorbed. In Case 4, above reported, the shadow in the subdeltoid region disappeared in eleven days.

Dr. Brickner says, "The deposition of lime in necrosed and inert tissues is a common phenomenon in pathology, *e.g.* in tuberculous processes, scars, corpora albicantia, etc., but its frequent, early, sometimes multiple appearance in the spinatus tendons after mild traumata has no parallel, so far as I know, in the human body." It would seem strange that such a peculiar phenomenon, as has been observed, should be confined to the subdeltoid region; and the writer has recently examined the roentgenograms of two cases which would seem to indicate that, at least, the same phenomenon may be present in the region over the greater trochanter of the femur and at the knee.

The first of these cases was a woman who complained of symptoms suggestive of bursitis over the greater trochanter of the right femur. A roentgenogram was taken, and a shadow suggestive of calcareous



FIG. 4.

The arrow points to a shadow over the greater trochanter. This shadow is similar to that seen in certain cases of subdeltoid bursitis.

deposit was found (Fig. 4). Under treatment by rest and hot packs, the patient quickly recovered; but, unfortunately, it has not been possible to obtain a second roentgenogram to see whether or not the shadow over the trochanter disappeared. The second case was that of a young man who injured the left knee by a fall from a bridge. A roentgenogram was taken six days after the injury, and showed a shadow on the outer side of the knee joint (Fig. 5, A). The leg and knee were put in a plaster cast, and three weeks later all trace of the shadow had disappeared (Fig. 5, B).

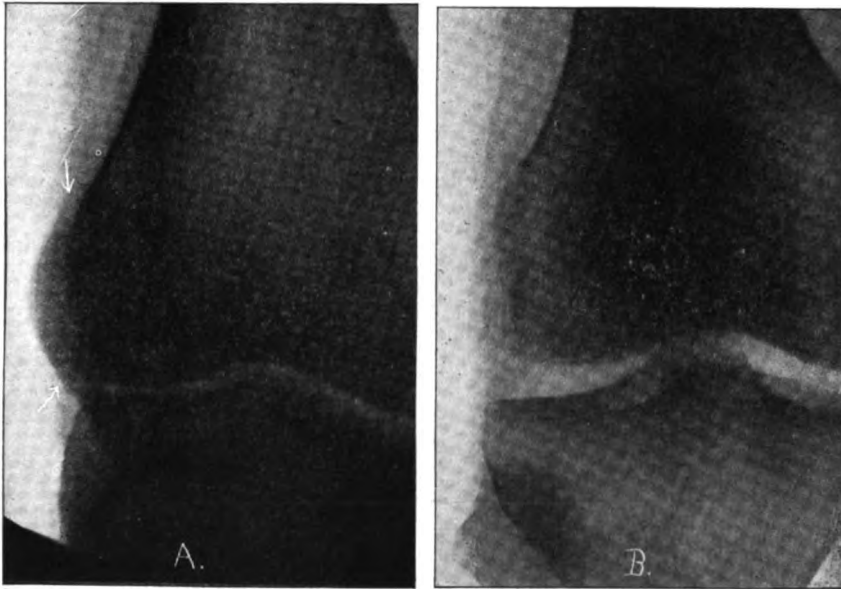


FIG. 5.

(A) The arrows point to a shadow over the external condyle of the femur. This shadow is similar to that seen in certain cases of subdeltoid bursitis.

(B) The same knee joint three weeks later; the shadow over the external condyle has disappeared.

That a calcareous deposit, if such it is, in the region of the subdeltoid bursa, is not always absorbed, or at least not for some considerable time, and that it may exist without causing serious disability, is shown by the following case.

The patient was an adult male, who had been having slight pain and stiffness in the right shoulder for some time previous to a fall on the outstretched arm, which wrenched the shoulder. Following this injury, an acute pain and stiffness developed. A roentgenogram showed a shadow in the region of the subdeltoid bursa suggesting the infiltration

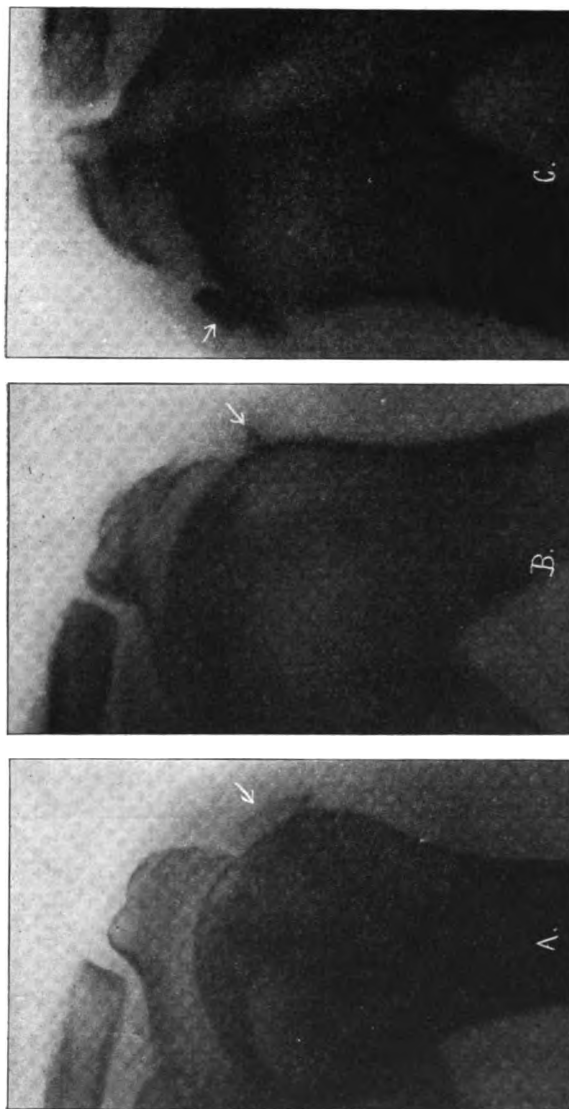


FIG. 6.

(A) The arrow points to a shadow in the region of the subdeltoid bursa (right shoulder).

(B) The same shoulder (right) five months later; the shadow now resembles that of a small calculus.

(C) Shadow in the subdeltoid region in the left shoulder.

of a fluid opaque to the roentgen rays (Fig. 6, A). Under restricted use of the arm and shoulder, the acute symptoms cleared up in about four days; but a slight disability and a "grumbling" pain when the arm was held in a certain position persisted, and the patient says that recently he has had slight symptoms in the left shoulder that lead him to think that he has a similar trouble there. A roentgenogram of the originally affected shoulder at the present time, five months after the first roentgenogram, shows that there is a shadow in the region of the subdeltoid bursa resembling a single small calculus (Fig. 6, B). A roentgenogram of the left shoulder shows what would seem to be a large nodular calculus (Fig. 6, C).

#### SUMMARY.

It is evident that in certain cases of clinically diagnosed, subdeltoid bursitis, the roentgen ray has shown shadows in the region of the subdeltoid bursa, which have been proved by operation to be due to a calcareous deposit; but it is in dispute as to just where the deposit occurs,—whether in the bursa, the walls of the bursa, or in the tendons and bodies of the spinatus muscles. In certain other cases, where the roentgen ray has shown shadows similar to the above, they have been observed to disappear under simple treatment, to exist without causing serious inconvenience, and to be present in at least two regions other than the subdeltoid, viz.: over the greater trochanter of the femur and at the knee joint. The shadows may appear very shortly after an injury, and have been observed to disappear almost as quickly. The shadows may be single or multiple, resembling the shadows of calculi, but are sometimes so extensive as to suggest the extravasation of an opaque fluid into the tissues. The operative findings would tend to show that the shadows are due to a calcareous deposit, but it is difficult to believe that a calcareous deposit could be deposited so rapidly and at times reabsorbed so quickly. The whole subject is at present very confused, and all cases should be carefully studied and checked up by roentgen-ray examination, operation when indicated, combined with careful anatomical study, chemical examination, etc.

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## CERTAIN ASPECTS OF INJURIES OF THE LOWER BACK.

BY ROLAND HAMMOND, M.D., PROVIDENCE.

DURING a recent service in the Orthopedic Department of the Rhode Island Hospital, I was more impressed than ever before with the conditions found in injuries of the lower back and sacro-iliac joints occurring in laborers and mechanics.

Since the enactment of Workmen's Compensation Laws in twenty-four of our states, these cases have been studied more carefully. This has been brought about partly by the zeal of the Commissions or Boards, in whose hands the administration of the laws has been placed, to the end that everything in the way of accurate diagnosis and treatment shall be done for these injured employees. Another reason is the advance in diagnostic ability, and especially the improvement in technique and interpretations of röntgenograms, which are of invaluable aid in forming accurate conclusions in these cases.

These injuries are exceedingly complex in nature, and it is only lately that we have begun to understand the true pathology underlying them. No one diagnosis will explain them all. It is pretty well recognized, however, that they fall into two general classes: (1) those cases where there has been an actual bone injury, such as fracture of the body, transverse process or spinous process of a vertebra, often associated with a partial luxation of one vertebra on another, or the slipping of an intervertebral disc; (2) cases of severe wrenching and strain, due to partial or complete rupture of ligaments, relaxation of the sacro-iliac or lumbosacral joints and associated with periarthrititis, periostitis and myositis of the structures involved. Both classes of cases show, in varying degree, muscle spasm, localized tenderness and induration, restricted motion of the spine and hips and atrophy in one or both thighs.

It is also recognized that certain anatomical types of spines are more easily disposed to injury than others. This is due to the unstable condition existing between certain of the vertebrae, notably the angle at which the fifth lumbar vertebra usually rests upon the top of the sacrum. A type of back easily predisposed to injury is the "teamster's back." His occupation subjects him to constant jolting, and he invariably sits in a doubled-up position on the wagon seat. The liability to strain and injury is very great, and given a severe accident in such a man, the resulting injury is likely to be serious.

In this paper I shall consider only those cases of severe wrenching and strain of the lower back, without demonstrable fracture, where the

disability has been marked and of long duration. These men were all hard-working and self-respecting, mostly in the prime of life and in previous good health, and when first seen by me had been unable to work for many months. Aside from the physical disability produced, they were absolutely without resource in a mental way, and were in a state of nervous unrest pitiful to see. This attitude of mind added an element to the problem which tended to prolong their invalidism.

Accurate diagnosis in such cases is admittedly difficult. One of our greatest aids is a technically perfect röntgenogram. In many injuries of the back the X-ray plate will reveal the cause of the disability, such as fracture of some portion of a vertebra, mal-alignment of a sacro-iliac joint, an already existing hypertrophic process which has been aggravated by the injury, or some other condition which will explain the symptoms. In a large majority of cases, however, the röntgenogram is of little or no help. This is disappointing, but should not be discouraging. It simply means that the art of röntgenography has not yet reached the point where these lesions can be accurately depicted. When the time comes that we can have an X-ray plate showing soft structures in detail, and at the same time giving a clear bone picture, we shall be much better able to arrive at a satisfactory diagnosis in these cases. Coon has described a cloudy appearance in the lumbo-sacral region in röntgenograms of these cases coming on several months after the accident.

One of the most discouraging features of these cases is their chronicity. All known methods of treatment seem to produce no immediate benefit, and one after another are given thorough trial without avail. It is only after a long period of time that relief comes, and that very slowly. Often the disability remains in part, at least, permanent. Many times the unfortunate patient is regarded as a malingerer. In this connection it may be well to quote from a recent article by Donoghue,\* Medical Adviser to the Industrial Accident Board of Massachusetts: "The writer has found very little conscious fraud attempted by injured employees. There is not the incentive for a wage-earner to remain from employment in the hope of getting large sums of money that existed in times past. . . Those who can afford to lay off are not those engaged in the industries insured. Oftentimes a long period of disability may be prevented if a little direct personal interest is taken in the cases of incapacitated employees by employers or surgeons. There

\* "The Injured Employee and the Workmen's Compensation Law. Results of Impartial Examinations." Francis D. Donoghue. *Boston Med. and Surg. Jour.*, Jan. 20, 1916, Vol. clxxiv, p. 76.

is needed definite follow-up treatment in accident cases after they leave hospitals. It is all right to give advice to an injured man, but for his good and for the good of the community, it would be much better if the proper treatment were given."

In the treatment of these cases, every available means has been employed,—adhesive plaster strapping, plaster jackets and spicas, back braces, pelvic belts, electric light and hot air baths, massage, liniments, etc. Improvement for a time has been noticed after one or another of the treatments, only to result shortly in a relapse into the former state of disability. One of the discouraging features was the fact that well-fitting jackets and spicas were badly tolerated by these patients. Whether the casts were really uncomfortable or from the high-strung nervous condition in which all these patients were found to be, it was necessary to remove the plaster inside of a week or two in nearly every case. We know it is the opinion of many eminent orthopedic surgeons in this country that prolonged fixation of these patients in jackets or spicas gives the best results in the end.

The social worker was of great help in rounding up these cases and inducing them to return for treatment after they had left the hospital thoroughly discouraged and feeling that nothing more could be done.

I wish to report six cases:

CASE 1. N. R., 33 years old, laborer, first seen Feb. 13, 1915, in the Orthopedic Out-Patient Department, Rhode Island Hospital.

*Present Illness.* Nov. 23, 1914, was struck in the back by a descending cement bucket and knocked forward against a sandpile. He was confined to bed for three weeks. After that had pain on moving or bending over. Is unable to work, but feels better when up than when lying down. Pain never radiates from lumbar region, except felt occasionally in right hip.

*Physical Examination.* Standing position fair except shoulders are rounded. All motions of spine slightly limited. Tenderness on pressure over lumbo-sacral joint. Forward bending causes pain in right sacro-iliac joint. Hip motions free. Lying straight, leg-raising causes pain in right sacro-iliac joint. Hyperextension of right thigh slightly limited.

Plaster jacket applied and worn one month, with slight improvement. He then had a course of electric light baths for three months, with manipulations of the thighs in hyperextension three times a week. No improvement.

June 17, 1915, was admitted to the Hospital, where examination under ether showed resistance to hyperextension of the right thigh.

Wassermann, negative. Röntgenograms of the lower lumbar spine in February and August, 1915, showed no evidences of bony injury.

In August, 1915, another jacket was applied without relief.

In October, 1915, examination showed the condition practically the same as when first seen eight months before, and the prognosis was given that the disability would last for months and might be permanent.

From September, 1915, to January, 1916, he was seen at intervals, and adhesive plaster strapping was applied without relief. In February, 1916, a pelvic belt of webbing reënforced with steels was applied, with more relief than any other treatment.

In April, 1916, the condition is practically unchanged in the 1 1/2 years since the accident.

**CASE 2.** J. B., 39 years old, teamster, first seen May 18, 1915, in the Orthopedic Out-Patient Department, Rhode Island Hospital.

*Present Illness.* Jan. 18, 1915, was struck in the back by a bale of grain weighing 450 pounds, and thrown violently to his knees, his body striking against the stake of a wagon. He was in bed eight weeks, and after getting around, worked for six weeks, when he was obliged to desist because of stiffness in the back and pain which radiated into the anterior hypogastric region and down the back of the thighs. He had difficulty in putting on his shoes, in getting up from chairs and in turning over in bed. Loss of 20 lbs. in weight and much strength.

*Physical Examination.* Stands with normal lumbar lordosis. All motions of lumbar spine slightly limited and each causes pain over fourth lumbar vertebra. Hip motions fair, at extreme each causes pain in lumbar spine. Lying straight, leg-raising to 90° on each side causes pain in lumbar spine. Hyperextension of thighs causes pain in lumbar spine, but not limited on either side.

Röntgenograms of lower dorsal and lumbar spine and hip joints show no evidences of bony injury. Same of both tibiae show the left tibia to be 5/8 in. shorter than the right. Wassermann negative. Adhesive plaster strapping was applied to lumbo-sacral region and he was told to rest. Heel of left shoe raised 1/2 inch.

In June, 1915, was admitted to Hospital, where he remained two weeks. Given electric light baths and rest in bed, without relief.

July 27, 1915. Had been better until in bending forward, he injured his back again.

During August, 1915, he was given electric light baths without relief. In September a belt was fitted which gave some relief. In November he was advised to do light work, such as running an elevator. In December he said he was worse again. In January, 1916, he was given a liniment and in February potassium iodide. In March a plaster

jacket was applied, which the patient removed in one week, saying he could not wear it.

He has not returned for further treatment.

CASE 3. A. del M., 43 years old, laborer; first seen May 29, 1915, in the Orthopedic Out-Patient Department, Rhode Island Hospital.

*Present Illness.* March 3, 1915, he fell 4 or 5 feet through a floor and landed on his left hip. Was in bed one month. During this time the hip swelled and one quart of water was drawn off. Has pain in the back and down left thigh and leg. Walking is painful. Loss of strength.

*Past History.* Pneumonia 10 years ago. Gonorrhea 25 years ago.

*Physical Examination.* Stands with left foot on floor, body straight but listed as a whole to the right. Bears weight wholly on right leg. Inspection of hips normal. Left hip shows only a few degrees of motion in all directions. Slight thickening about great trochanter. Left leg  $\frac{3}{8}$  in. shorter than right. Right hip shows motions fairly normal, although restricted at extremes of motion. Back motions all markedly limited and extremely painful, especially on left side.

Röntgenograms of lumbo-sacral spine, left hip and entire left femur show no evidence of bony injury or disease. Wassermann, negative.

June 3, 1915, was admitted to Hospital and remained there six weeks. Manipulation under ether showed free spinal movements. Plaster spica was applied without relief and also a jacket, which was later removed at patient's request.

When last seen, Nov. 10, 1915, his condition was practically unchanged and the opinion was given that it was probably permanent.

CASE 3. M. G., 41 years old, laborer, first seen May 24, 1915, in the Orthopedic Service, Rhode Island Hospital.

*Present Illness.* December 28, 1914, he fell 20 feet from a ladder. Was taken to the Rhode Island Hospital where he was treated for a fracture of the 11th and 12th ribs, about 3 ins. to the left of the vertebral column. No complaint made of the back at that time. Left the Hospital in about a week, and since then has been confined to the house, part of the time in bed. Can walk with the aid of a cane, but any special movement causes pain in the lumbo-sacral region.

*Physical Examination.* Lying straight, leg-raising possible on the right to  $45^{\circ}$ , on the left to  $30^{\circ}$ . Hyperextension of thighs practically absent. All movements of lumbar spine much restricted. Manipulation under ether showed moderate rigidity of the lumbar spine. Röntgenogram of lumbo-sacral spine and Wassermann negative.

June 23, 1915, a plaster jacket was applied, but was removed 10 days later on account of edema of the ankles.

Aug. 3, 1915, another jacket was applied, but was removed a week later. Back was strapped with adhesive plaster and patient discharged to his home. He has never returned for treatment, but is reported as being confined to his house.

CASE 5. I. S., 44 years old, laborer; first seen Dec. 28, 1915, in the Orthopedic Out-Patient Department of the Rhode Island Hospital.

*Present Illness.* In September, 1915, following heavy lifting, he strained his back and experienced severe pain on sitting, standing and lying. Obligated to go to bed for four weeks. Pain felt in small of back and in right leg, never severe but constant. After being up for a short time, was obliged to go to bed again. He was then removed to the Rhode Island Hospital, where he remained six weeks. While in the Hospital the sacro-iliac joints were manipulated under ether and the motion found slightly restricted. Later he had electric light baths and daily hyperextension of the thighs. He was much improved on leaving the Hospital and able to work.

*Physical Examination.* Stands with abdomen slightly prominent, but otherwise fair position. Dorsal kyphosis slightly increased. All motions of lumbar spine slightly limited. Hip motions fairly free. Lying straight, leg-raising on each side to  $70^{\circ}$  without pain. Hyperextension of thighs fairly free and equal. All motions are "stiff." Given electric light baths for one month.

Feb. 1, 1916, there was found more resistance to hyperextension of the right thigh than the left. Adhesive plaster strapping was applied and later a pelvic webbing belt. Continuous improvement was noted during this time.

CASE 6. N. S., 40 years old, laborer; first seen Nov. 9, 1915, in the Orthopedic Out-Patient Department, Rhode Island Hospital.

*Present Illness.* Six months before this he was struck in the back by a pipe and knocked down. Has worked at times since the accident, but not continuously. Has pain in the back and behind the right knee; worse when recumbent.

*Physical Examination.* Standing position fair. Lumbar spine limited slightly in lateral bending equally on both sides. Hip motions fairly free. Lying straight, leg-raising on right to  $50^{\circ}$ , on left to nearly  $90^{\circ}$ . Length of legs equal. Hyperextension of thighs not limited;  $1\frac{1}{2}$  in. atrophy of right thigh. Knee-jerks present.

Röntgenogram shows lipping of bodies of 4th and 5th lumbar vertebrae on both upper and lower surfaces.

Under electric light baths and manipulations of the thighs in hyperextension there was steady improvement. Later he was able to do light work. When last seen, Apr. 8, 1916, he was much improved.

# Editorial

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## OBSTETRICAL PARALYSIS.

It is of interest to note that there has been no paper published in the *AMERICAN JOURNAL OF ORTHOPEDIC SURGERY* of late years dealing with the subject of Obstetrical Paralysis. This indicates that the Orthopedist has not taken a great deal of interest in this subject, and shows why the possibilities of treatment are not generally known. Therefore, we are glad to present this month Dr. Sever's paper, which takes up the whole subject from an orthopedic standpoint, and to emphasize the importance of orthopedic treatment.

It is quite evident that Obstetrical Paralysis has not been very well understood. Neither the laity nor the medical profession as a whole appreciate the possibilities of good results by carefully-planned treatment, and are rather apt to consider the damage done and to rest content. This has come about largely because the whole attention has been focused on the immediate nerve lesion, and when the immediate recovery takes place, as far as the actual paralysis is concerned, then, as a rule, nothing more is done, and the ultimate deformities result.

It is possible to draw an analogy between Infantile Paralysis and Obstetrical Paralysis, although the causes are absolutely different. In a broad way both leave an initial damage to the nervous system, with a resulting effect on the muscles which correspond. In both conditions there is more or less recovery of function, that takes place in the early stages. Also in both conditions there will develop more or less deformity, and therefore the orthopedic treatment consists, first, in the prevention of deformity, and second, in the correction of deformity—two basic principles in the practice of orthopedics.

It is hoped that more attention will be paid to Obstetrical Paralysis, and one way to accomplish this is to report the results of orthopedic treatment. The condition is not very uncommon, and if it is realized that proper treatment will prevent and correct deformities, then we can place the treatment of this condition on a definite basis, as is now accomplished in Infantile Paralysis.

## ANTERIOR POLIOMYELITIS.

## THE NEW YORK EPIDEMIC.

In the weekly bulletin issued by the New York Board of Health, June 24, there appeared the following announcement:

"Within the past two weeks an unusual number of cases of poliomyelitis have been reported in Brooklyn, especially from the section bounded by Henry Street and Seventh Avenue, Baltic and First Streets. Altogether some four dozen have been reported since June 1, all but one in the practice of private physicians."

In the section above referred to 17 cases were reported between June 6 and 17, as follows: 2 cases on June 6, 4 cases on June 8, 7 cases on June 10, 4 cases on June 17. This includes an area of 11 blocks in one direction and 5 in the other.

During 1913 there was a total of 55 deaths.

During 1914 there was a total of 34 deaths.

During 1915 there was a total of 13 deaths.

There were but two cases reported between the first of January and the first of May, 1916.

During May there were five cases reported, with one death, as follows:

May.	Cases.	Deaths.
4.....	1	
13.....	1	
17.....		1
23.....	1	
27.....	1	
31.....	1	
	<hr/> 5	

During June there was a total of 331 cases in Manhattan, Bronx, Brooklyn, Queens and Richmond, with 65 deaths, as follows:—

June.	Manhattan.		Bronx.	Brooklyn.		Queens.		Richmond.		Total.	Total.
	Cases.	Deaths.		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
6.....				2						2	
7.....					1	1				1	1
8.....				4						4	
9.....		1									1
10.....	2			2						4	
11.....					1						1
12.....				2						2	
13.....	1			1	1					2	1



June.	Manhattan.		Bronx.	Brooklyn.		Queens.		Richmond.		Total.	Total.
	Cases.	Deaths.		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
14.....	2			2						4	
15.....	1									1	
16.....				3						3	
17.....				3	1					3	1
18.....					1						1
19.....	1			1						2	
20.....		1		7	1	1		1		9	2
21.....				12	5					12	5
22.....	2			16	1					18	1
23.....	1			42	1					43	1
24.....	1			12	2					13	2
25.....				16	9					16	9
26.....	1			16	5	1		1		19	5
27.....	6	2		38	5					44	7
28.....	4	3		23	6	1		2		30	9
29.....				45	10	1		3		49	10
30.....	11	2		38	6			1		50	8
Total .....										331	65

From June 6 to July 15 there was a total of 1920 cases in Greater New York, with 366 deaths, as follows:

July	Manhattan.		Bronx.		Brooklyn.		Queens.		Richmond.		Total.	Total.
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1.....	8		2	1	45	10	4		2	1	61	12
2.....	6	1	3		48	17			7		64	18
3.....	7	1	3		50	8	1	1	8	4	69	14
4.....	9		1		46	24	2		3		61	24
5.....	10	1	1	1	51	7	3		3		68	9
6.....	16	2	3	2	90	21	1	1	3		113	26
7.....	13	2	3		60	15	3	2	8		87	19
8.....	12		2		74	13	1	2	6		95	15
9.....	8	3	3		66	14	8	1	3	1	88	19
10.....	30	3		1	68	9	1		4	1	103	14
11.....	14	6	7	3	155	20	13	3	6		195	32
12.....	12	4	1		131	12	13	1	5		162	17
13.....	16	2	3		76	18	12	3	10	1	117	24
14.....	14	6	6		122	16	11	8	9	1	162	31
15.....	30	7	4		87	16	12	2	11	2	144	27
Grand total.....											1920	366

A large number of the cases, about 50%, are in Italian families. Out of 1087 verified cases,

124, or 11.5%, were under one year of age.

244, or 22.5%, were 1 year of age.

269, or 25%, were 2 years of age.

195, or 18%, were 3 years of age.

85, or 8%, were 4 years of age.

That is to say, 917, or 85% of all cases, were under 5 years of age. Between 5 and 10 years of age there were 155 cases, or 14% of total, so that 99% of all cases were under 10 years of age.

The total number of cases reported to date of July 15, inclusive, is 1920; the total of deaths reported is 366, as above stated, or 19%. Death occurs within the first 24 to 48 hours, and is due to respiratory paralysis,—evidently a bulbar involvement.

Several instances of three cases in the same family have been reported. Five to eight per cent. are secondary cases in the same family. Frequently a number of cases have been reported in the same dwelling. An interesting feature of the epidemic is the number of cases of abortive type. These represent about 50% of all cases. The virulence of the disease in the remaining 50% is fully appreciated when we consider the high mortality above cited. In the epidemic of 1907-8 some 2500 cases were reported, of which the death rate was but 5%. About 7% recovered completely and 25% recovered "fairly."

The sanitary conditions of the dwellings infected are described by the Board of Health as "dirty to fair." There are very few colored children affected. These facts and figures are most significant.

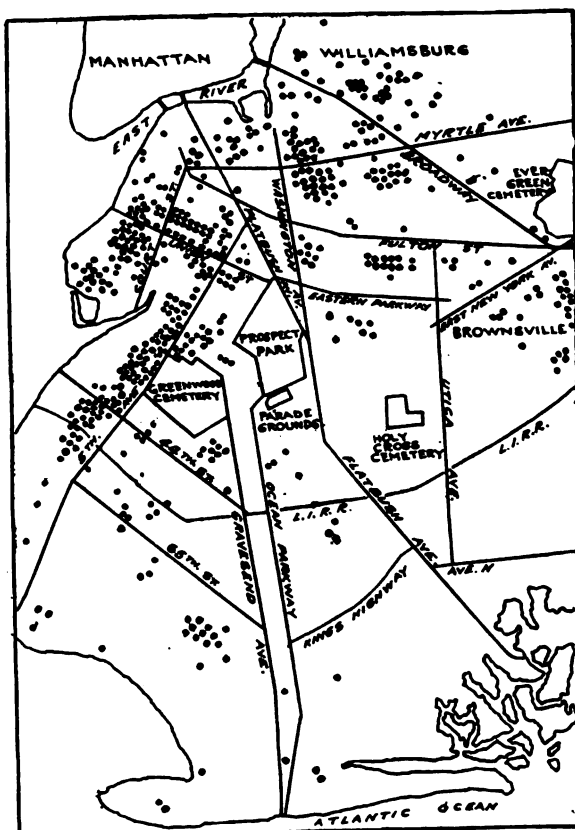
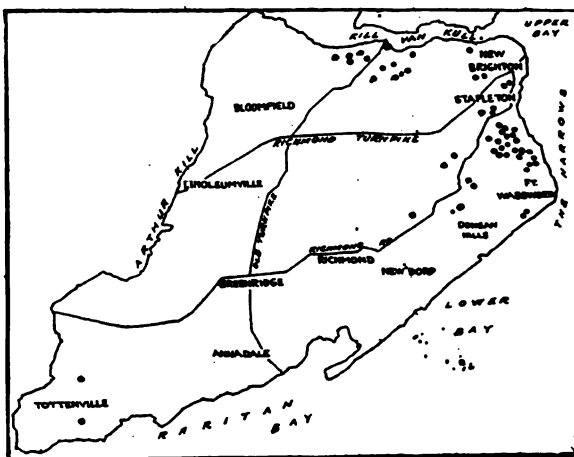
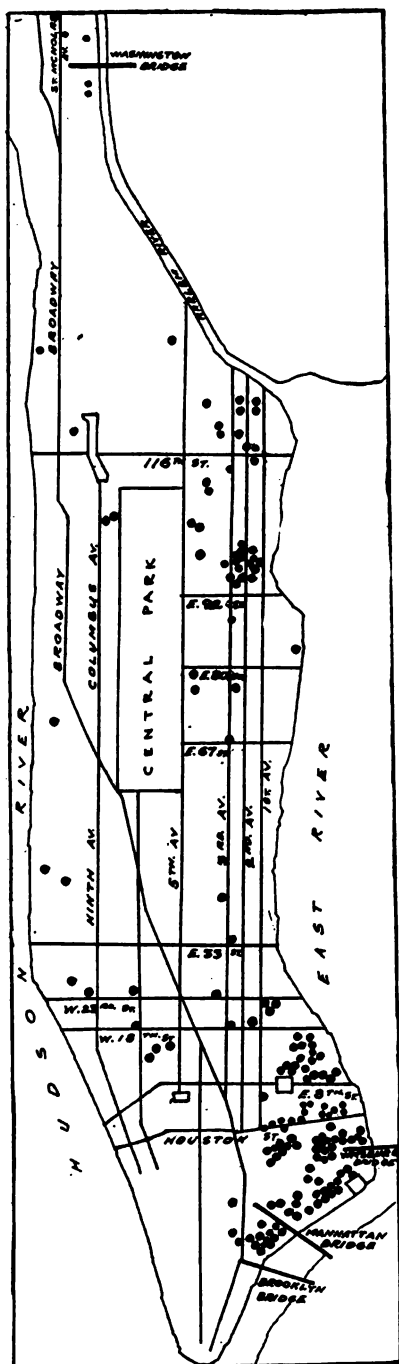
When it was realized that the disease had become epidemic, the Board of Health, after a careful consideration of the subject, decided to make a public campaign against the disease in the public papers. Since July 1 daily reports relative to the epidemic have been published in the press. This has had its advantages; it has also had its disadvantages. The populace has become panic-stricken to a much greater degree than the conditions justify.

#### PREVENTIVE MEASURES.

On June 19 there were distributed by the Board of Health 2500 circular letters. These were sent to all the physicians in Brooklyn. Attention was called to the severity of the epidemic and the coöperation of the physicians strongly urged. They were requested to follow up carefully the suspicious cases.

On June 21 the Department of Health issued in the press Bulletin No. 458, in which the parents were asked to seek competent medical advice promptly, even in what might appear to be minor ailments in children. In all cases of running noses or cold in the head, the nasal discharge should be carefully looked after.

On July 4 the following instructions appeared in all the papers:



"Keep your children out of the streets as much as possible, and be sure to keep them out of the houses on which the Department of Health has put a sign.

"The daily paper will tell you in what houses the disease is.

"This is the disease which babies and young children get. Many of them die and many who do not die become paralyzed for life.

"Do not let your children go to parties, picnics or outings.

"If your child is sick, send for your doctor or notify the Board of Health."

On July 5 the New York State Department of Health notified all the physicians in New York State of the gravity of the epidemic, reporting 10 cases outside of New York City. The notification also instructed the doctors relative to the care and treatment of all cases which simulated the disease.

It will be noted that for the first time the Board of Health has seen fit to quarantine the houses infected. They have enforced strict quarantine measures and have insisted upon the removal to the hospital of all cases. They have published lists of the infected houses. There has been established a daily visit by the nurses until quarantine has been released. Quarantine continues for two months if the patient remains at home, ten days if the patient is taken to the hospital. The Board insists upon the removal of the patient to the hospital, unless the parents can provide isolation and care equal to that of the best private hospitals. About 300 of the first 500 cases have remained at home. The remainder have had hospital care. When quarantine has been broken, the authorities in the locality to which the patient has gone have been notified and the patient, or family, returned.

Every effort is being put forth to stem the tide of infection. The greatest difficulty is to prevent carriers from spreading the disease to other localities. The plates herewith appended can best demonstrate the areas infected up to the middle of July.

It is particularly interesting to the orthopedist to see a large majority of these cases now being treated in the several hospitals with plaster-of-Paris dressings for rest and immobilization. This, with the quiet hospital care, comprises essentially the treatment of these cases. No medication has as yet been suggested that offers any material relief.

It will be of the greatest interest to follow up these cases, relative to the extent and permanency of the paralysis.

CHARLES OGILVY.

# New Apparatus

## A NEW SPINE BRACE FOR THE ROTATION (ABBOTT) TREATMENT OF SCOLIOSIS AND FOR OTHER PURPOSES.

BY H. WINNETT ORR, M.D., LINCOLN, NEBR.

I WISH to present a spine brace especially designed for the rotation treatment of scoliosis, which represents something new along this line.

In carrying out the principles of the Abbott method for the treatment of scoliosis I have been accustomed until recently to rely wholly upon plaster and celluloid jackets.

The brace, which I will describe, consists of a wide and strong pelvic band with a vertical cylindrical rod running up the back. This rod may be straight or fitted to the back. Just now I prefer it straight. Over this rod I drop little collars corresponding somewhat in size and position to the vertebrae. These have toothed edges so that each fits securely against the next one in whatever position I choose to place it. Some of these collars carry "ribs," which may be placed at any level or in any position of rotation desired.

In this way a rotation pressure may be exerted upon the ribs at any point and in any degree. Near the top I have two of these collars or

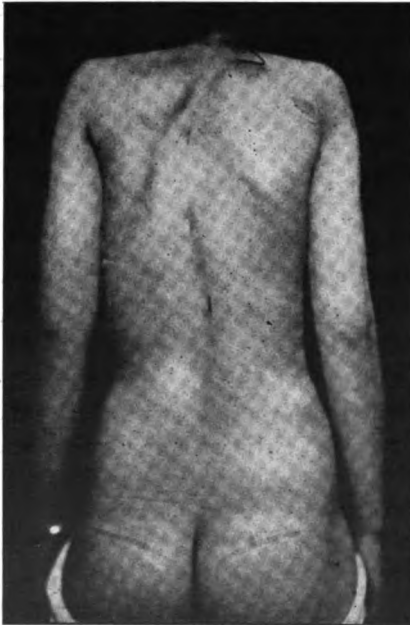


FIG. 1.—Girl of 12. Left dorsal scoliosis.

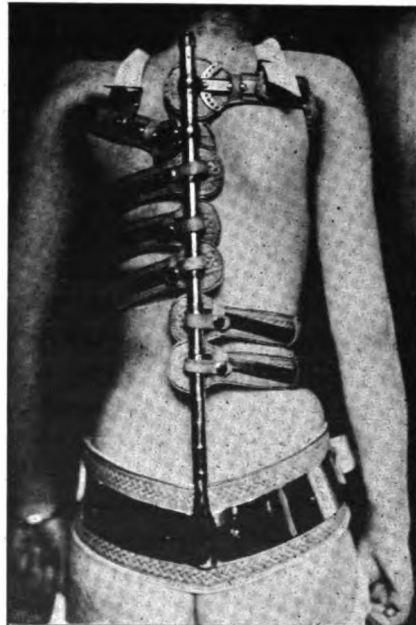


FIG. 2.—Same patient with rotation brace applied. Pressure over rib convexity with left shoulder low but forced backward. Right shoulder high and held forward.

"vertebrae" which carry special pieces for supporting the shoulders. These, also, may be placed in any position desired. Having placed all these parts in the position I desire, a nut is turned securely down against the top "vertebra," and the entire brace is thus securely locked.

The very great advantage of this brace will be apparent at once to any one who has ever undertaken to use the Abbott method. At the present time I have made no provision for counter pressure on the front of the chest. Just how I shall do this, or whether I shall do it at all, I have not fully decided.

This brace has two or three very important advantages:

1. Positive rotation correction may be obtained with it.
2. The brace is infinitely adjustable for position or growth at any time, for any patient, without actual alteration or weakening of any part.
3. There is no constriction of the chest.

This brace has already been applied to several patients, and is at once proving more satisfactory to wear and more efficient than any other I have tried, and I have tried a good many. It is not much heavier than the ordinary spine brace, but somewhat more expensive. The special dies, etc., necessary for its manufacture are now complete, however, and it can be made more cheaply than at first.



FIG. 3.—Full length view of same patient.

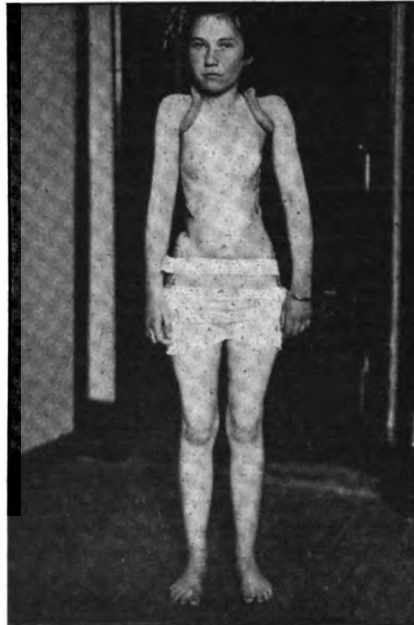


FIG. 4.—Front view showing control of shoulders and absence of chest constriction.

# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, Etc.
- X. War Surgery.

## I. TUBERCULOSIS OF BONES, JOINTS AND TENDONS.

CRIPPLED TUBERCULOUS CHILDREN. H. J. Gauvain. *British Journal of Tuberculosis*, April, 1916.

A continuation of the article appearing in the January issue, being a consideration of certain principles governing the correction of deformity in tuberculous disease of the spine and hip. He states, "I do not regard the ultimate result of treatment as altogether satisfactory unless the disease is not only completely arrested, but also the patient has recovered a useful range of movement and is left with little appreciable deformity."

During the acute stage, he uses recumbency, immobilization and extension in line of deformity. "The deformity may be gradually corrected by readjusting the direction of the pull, as the muscles causing the deformity are stretched and tired out." It is our opinion that the spasm is lessened, or relieved completely, during traction, not because the muscles are "stretched and tired out," but because the traction has relieved the muscles from the necessity of being in a state of spasm. They are never too tired to return to spasm with an interruption of traction.

He states that patients discharged with hip joints ankylosed by fibrous tissue frequently recover excellent movement after one or two years' immobilization in a celluloid hip splint. It would seem to us that at the time of discharge, the hip joint was not fully cured if further immobilization produced movement.

Plaster spicas or celluloid splints are preferred to the Thomas hip splint, which is the most commonly employed in England. The "Taylor" or "Bradford" splints, which are so much used in this country, have not the mechanical deficiencies of the "Thomas" hip splint, and are much better, we believe, for the employment of traction than spica or celluloid splints.—J. J. Nutt, *New York*.

CASE OF SECONDARY HYPERTROPHIC OSTEOARTHROPATHY IN GIRL ELEVEN YEARS OLD. C. Herrmann. *Amer. Jour. Dis. Children*, April 1916.

Only seven cases of this condition are reported in the literature as occurring in children out of a total of one hundred and forty-four. The case reported was in a girl eleven years of age, who developed a spinal deformity at seven years and was operated for a destructive process involving the fifth, sixth, and seventh dorsal vertebrae, the Hibbs method being used. The child did not improve, as the deformity increased, and paraplegia developed for a time. A little over three years after the operation, clubbing of the fingers

and enlargement of the knees and ankles were noticed. The Roentgen findings showed a well-distributed formation of new bone under the periosteum of the metacarpals and the lower end of the femur and the upper end of the tibia. The von Pirquet was positive and the Wassermann was negative. As a possible theory for the process, it is suggested that the chest deformity and decrease in pulmonary action produced a toxemia and circulatory inhibition, which affected the distal bony structures. Locke found that in adults the disease was preceded by some chronic disease of the lungs in 78% of his cases.—*Custis Lee Hall, Boston.*

REST OF INDIVIDUAL LUNG BY POSTURE. G. B. Webb, A. M. Forester, and F. M. Houck. *Colorado Medicine*, May, 1916.

Webb, Forester, and Houck, in a preliminary report, claim results in pulmonary tuberculosis by training the patient to rest on the affected side, which is supported further by a small, firm pillow. This produces a certain degree of hyperemia, and as a result the amount of sputum and fever is reduced, healing promoted, and relapses hindered.—*Robert D. Maddox, Cincinnati.*

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

SUBACUTE ANTERIOR POLIOMYELITIS. A. W. Harrington and J. H. Teacher. *Glasgow Medical Journal*, May, 1916, pp. 331-338.

Report of one case, a woman of forty-eight years, with a flaccid paralysis beginning in the peroneal group of muscles, rapidly extending to the upper extremities, and finally involving the muscles of respiration. Paralysis preceded by atrophy. Reaction of degeneration present. No fibrillary tremors. No disturbances of sensation except shooting pains in right leg. Duration of illness less than one year.

The point of interest lay in the differential diagnosis between peripheral neuritis and anterior poliomyelitis. The paralysis was in keeping with either diagnosis, but there was no marked disturbance of sensation nor tenderness of nerve trunks. Later the selective nature of the palsy and marked atrophy pointed to anterior poliomyelitis.

Microscopical examinations revealed degenerative changes in cells of gray matter, which were very advanced in the spinal cord, less advanced in the medulla and pons, and slight in the basal ganglia and brain. There was no peripheral neuritis and no degeneration of tracts.

The history of the case is described in detail, with some discussion about the existence of subacute and chronic anterior poliomyelitis as a distinct entity.—*H. W. Marshall, Boston, Mass.*

TENDON TRANSPLANTATION. Arthur T. Legg and Frank R. Ober. *Interstate Med. Jour.*, May, 1916.

The authors present some of their views based on 100 cases of tendon transplantation about the foot, performed at Boston Children's Hospital. Nothing new is presented, their object being to emphasize the factors which they believe essential to success, also the causes of failures. Their conclusions are:

A good functional result is the aim of tendon transplantation, therefore we should choose cases in which it offers some hope of improvement.

Each individual case is a law unto itself; hence we should accurately determine the muscles paralyzed and the relative strength of weak ones, and attempt to obtain perfect post-operative muscle balance.



We should give strict attention to minor details in our technic, so that we may obtain perfect attachment of tendon to bone, and carry the tendon, with possibly a part of its muscle, in a course that will act to the best mechanical advantage.

After-treatment is of vital importance to the success of the operation.—  
*R. Wallace Billington, Nashville.*

THE PHYSIOLOGICAL METHOD OF TENDON TRANSPLANTATION.. L. Mayer. *Surg., Gynec. and Obst.*, xxii, 1916, February, p. 182; March, p. 298; April, p. 472.

A series of three papers by Mayer in *Surgery, Gynecology and Obstetrics* make up a monograph on tendon transplantation. It is very complete and must be read to be appreciated. His conclusions are the result of studies carried on in the experimental department of the Oskar-Helene Home for Crippled Children in Berlin.

Mayer says that the term tendon sheath is loosely applied; that is, we speak of the sheath of the tendo Achillis or the semitendinosus, whereas there is no true sheath in either. The true sheath corresponds to a joint, and his experiments, contrary to those of Retterer, show that the tendon sheath is a sharply circumscribed cavity, containing a synovia-like fluid.

As the intestines have a mesentery, so do tendons have a mesotenon, serving the same purpose of transmitting blood vessels. In some tendons, that is, the tibialis posticus, the flexor longus hallucis and the flexor longus digitorum, it is usually absent. There is at each end in these tendons a sort of residuary mesotenon. He suggests as a new term for the peritenonium externum, that of paratenon, and for the same structure as it lies in the tendon sheath, epitenon. For all the connective tissue structures associated with the tendon he prefers the old term, peritenon. He takes issue with Koelliker's statement that tendons are practically bloodless, for by his experiments he was able to show that, although they are much less vascular than muscle or the surrounding connective tissue, there are blood vessels present. A definite anatomical knowledge of the blood supply of each tendon should be known, *e.g.*, the tendon of the flexor longus hallucis derives its blood supply from a vessel which reaches the tendon via the proximal vinculum (residuary mesotenon) at the lower border of the muscle fibres. This vessel runs down the posterior border of the tendon and anastomoses with a vessel coming up from the distal vinculum. With care, this vessel from the proximal vinculum can be preserved during the operation for transplantation.

The author's observations on the gliding of tendons in the sheath are interesting. The gliding action is least near the insertion, and here the mesotenon is shortest. In transplanting a tendon, *e.g.*, peroneus longus to tibialis anticus, the foot should be held in calcaneo-varus and the tendon sutured to its new insertion, with just enough tension to render it taut.

Certain general rules are laid down to govern the operative technic. Wherever possible, the normal relation should be restored between the tendon and sheath. The transplanted tendon should run through tissue adapted to the gliding of tendon, and he mentions as examples that boring of holes through bone and interosseous membrane should be avoided. The normal insertion of the tendon must be imitated wherever possible by implanting the transplanted tendon directly into bone or cartilage. The normal tension of the transplanted tendon should be reestablished, and the line of traction should be such that the tendon will not be at a mechanical disadvantage. He describes in detail, as examples, three operations. A long list of operations is appended in his paper, to cover the different types of deformity. After transplantation of a tendon by accurate and physiological

technic, early function should be instituted, beginning active motion within a few days. Prolonged rest causes atrophy of the tendon.—*M. S. Henderson, Rochester, Minn.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

**SYPHILITIC OSTEOPERIOSTITIS.** J. Garland Sherrill. *Urologic and Cutaneous Review*, March, 1916.

Sherrill calls attention to syphilitic bone changes being recognized in the secondary stage, due to our improved methods of diagnosis. Occasionally surgery must be resorted to in order to remove a bone sequestrum, especially when a secondary infection to the syphilis has occurred.

This condition is the most common form of bone lues, and can be recognized from the following Roentgen characteristics: "A combination of gummatous periostitis and osteitis, with an ossifying periostitis and osteitis, and osteoporosis plus an osteoplastic process."—*Custis Lee Hall, Boston.*

**HEREDITARY SYPHILIS AS AN ETIOLOGICAL FACTOR IN SPURS ON THE OS CALCIS.**

Paul P. Swett and Henry Farnum Stoll. *Surg., Gynec., and Obstet.*, June, 1916.

The authors present a series of nine cases in which the X-ray showed the presence of spurs on the os calcis. Three had been operated upon without permanent relief. None of the cases gave a positive Wassermann test, but the family histories of all were strongly suggestive of hereditary syphilis. Specific treatment was employed, with highly satisfactory results in all the cases.

The article is illustrated with some excellent radiograms, and it brings to the attention of the profession a very valuable point in the treatment of sore heels.—*H. A. Pingree, Portland, Maine.*

**OSTEOARTHRITIS.** H. W. Wilcox. *Colorado Medicine*, May, 1916.

Wilcox applied the term osteoarthritis to non-tuberculous chronic joint conditions, occurring mostly in adults, and while favoring Goldthwait's classification of infectious, atrophic, and hypertrophic types, concurs with the growing opinion that, regardless of the pathological cause, the end-result is practically the same. After considering trauma and the various sources of infection, he details briefly the symptoms presented clinically, and advocates rest, removal of focus of infection, and correction of deformities as principles of treatment of unquestioned value. In addition he believes the use of dry, hot air and hydrotherapy, and later massage, to be of benefit in some cases, but doubts the value of internal medication, excepting those measures which tend to improve the general health.—*Robert D. Maddox, Cincinnati.*

### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

**A CASE OF PAGET'S DISEASE (OSTEITIS DEFORMANS).** H. W. Connolly. *Med. Jour. of Australia*, April 1, 1916, pp. 283-285.

Four photographs, with case history, physical examination and pathological note. The patient was a blacksmith and miner, with good personal history, aged fifty-nine years, who had been troubled with muscular rheu-

matism for several years. No etiological factors determined, but the writer is of the opinion that among derangements of internal secretions may be found the clue to the cause of the disease.—*H. W. Marshall, Boston.*

## V. SCOLIOSIS AND STATIC DISTURBANCES.

NEW METHODS USED IN THE STUDY OF FLAT-FOOT AT YALE. William M. Anderson. *Medical Times*, May, 1916.

This article is a description of the well-known apparatus for observing static foot errors.

The patient stands on a glass slab, under which, at a proper angle, is a mirror. This reflection is thrown forward on another mirror in order that the patient himself may see.

The author states that for the examination of college students it is especially useful, as it stimulates them to make more energetic efforts for correction.—*C. L. Lowman, Los Angeles.*

WEAK FEET. Jacob Grossman. *Interstate Med. Jour.*, May, 1916.

An article based on a study of 700 cases. The subject is discussed at length and contains much valuable detail. The main points emphasized are as follows: Weak feet should be treated in infancy and childhood, even though symptomless, as a prevention against trouble in later life; all feet in infancy appear flat, but are not flat; allow creeping and walking periods to occur spontaneously; correct shoes and broad-toed stockings; where indefinite pains are complained of, always eliminate weak feet as a cause; flat-feet are the exception, therefore foot impressions are misleading; eversion of the heels and heel cords is the most constant sign present; where foot-plates are necessary the Whitman plate is preferred.—*R. Wallace Billington, Nashville.*

## VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.

THYROID TUMORS OF THE BONES. J. Phillip Kanoky. *Surg., Gyne. and Obstet.*, June, 1916.

The author, by means of numerous quotations from the writings of authorities, concludes that thyroid tumors are due to metastases from malignancies in the thyroid gland or to aberrant embryonal tissue.

In one case of his own, operated upon and followed in thirty-six hours by death, the writer removed a large tumor from the temporal region, which had destroyed portions of the temporal, frontal and parietal bones, and had pushed the dura ahead of it into the cranial cavity for a distance of two and one-half inches. Macroscopically and microscopically, the tumor had the appearance of thyroid structure.

Twenty-three cases of thyroid tumor from the records of several surgeons are appended.—*H. A. Pingree, Portland, Me.*

SUBACROMIAL BURSTITIS AND CONCRETIONS. W. W. Plummer. *New York State Jour. of Medicine*, April, 1916.

A discussion of the etiology, diagnosis and treatment of pain and stiffness at the shoulder-joint due to subacromial bursitis. Five illustrative cases observed by the writer are recorded. The article is illustrated by seven radiographs. The author's personal experience with the cases reported would tend to confirm the views and statements expressed by Brickner.—*A. J. Davidson, Philadelphia.*

## VIII. TRAUMATIC LESIONS, FRACTURES, AND DISLOCATIONS.

FRACTURE OF THE OS CALCIS. Benjamin F. Lounsbury. *Surg., Gyne. and Obstet.*, June, 1916.

In this excellent and very practical article, Dr. Lounsbury indicates the signs of fracture, such as deformity, crepitus, and above all, the radiogram. He describes at some length the different types of breakage in the calcaneum. He uses Cabot's method of reduction where the shape of the fragments is suitable.

A sound in front of the tendo Achillis holds the posterior fragment down, while, with a piece of piping the anterior one is lifted into place. The tendon is cut and the foot and leg put up in plaster. Manipulations are allowed in four weeks, and weight-bearing supported by an arch in ten.

The author lays especial stress on the use of the X-ray in diagnosis, and upon a well-secured reduction of the fragments.—*H. A. Pingree, Portland, Maine.*

RECURRENT DISLOCATION OF THE SHOULDER. James K. Young. *Interstate Med. Jour.*, May, 1916.

The following conditions are named as favoring recurrences: 1, large tears in capsule; 2, lax condition of capsule; 3, fracture of inner edge of glenoid cavity; 4, muscular atrophy; 5, rupture of external rotators or avulsion of greater tuberosity. The author's operation is intended to change the leverage of the two most powerful dislocating forces and consists of dividing the lower halves of the tendons of the pectoralis major and latissimus dorsi, followed by maintaining arm on a triangular splint for two weeks to prevent union of divided portions of tendons. Advantages of the operation are that the joint is not opened to infection, prompt recovery and no loss of power.—*R. Wallace Billington, Nashville.*

## X. WAR SURGERY.

APPARATUS FOR FRACTURES OF THE EXTREMITIES IN WAR. E. Feldman. *Munch. med. Wochens.*, Mar. 7, 1916, lxiii, No. 10.

The difficulty in the use of plaster dressings at the front suggested to the author the use of wire splints, which are more easily transported and applied. He has evolved several, the first described being used for fractures of the upper arm and the second for those of the femur. In the first he makes use of the principle of the Mitteldorf triangle splint, the wire splints supporting the upper arm and the elbow, and in addition rest against the side of the chest. There is also a support for the forearm and the hand. These wire splints in themselves are nothing more than longitudinal wires, with cross-wires at frequent intervals, which can be bent into any desired shape. The splint for the femur has supports for each leg, and a triangular section for the space between them, thus furnishing support for the inner side of each leg. In case of single fracture the under support is used only for the fractured side, but where there are fractures of both sides both are used. All of these splints are bandaged to the affected parts and furnish absolute immobilization, greater comfort to the patient, and great ease of transportation of a severely wounded patient. The article is illustrated by drawings and figures which make clear the application of the splints.—*Ralph S. Bromer, Louisville.*

SUPPURATIVE ARTHRITIS OF THE KNEE JOINT, CAUSED BY GUNSHOT WOUNDS. Robert Gouverneur. *Paris Médical*, April 1, 1916, vi, No. 14.

The article deals with suppurative arthritis, accompanied by fracture of the articular extremities, as these are the ones most frequently met with, as shells and howitzers are more generally used.

When the bones are not involved in the wound, but only the synovial membrane, puncture or arthrotomy is usually sufficient, the patients leaving the hospital with only slight stiffness. Where the articular ends of the bones were involved in the fracture, the results proved rather disastrous.

Thorough drainage and early resection sometimes saved the limb, but as a rule, amputation had to be resorted to, and when effort at saving the limb had been carried on too long the patient died after the amputation, and the specimens showed decided evidence of osteomyelitis.

Secondary amputation after resection saved some lives, but the results were not as good as primary amputations.

He insists, in closing, that though sometimes the ordinary routine of arthrotomy and drainage seemed sufficient, he is convinced that where the bones are involved, nothing short of excision or amputation will suffice.—*Daniel LaFerté, Detroit.*

**HOOKE TO EXTRACT BULLETS FROM THE INTERIOR OF BONE.** Leon Imbert. *Paris Médical*, April 1, 1916, vi, No. 14.

Leon Imbert illustrates a wire hook, which he has found far superior to anything heretofore used in extracting bullets from the interior of bone. He has found it far superior to trephining and inserting forceps, which frequently necessitated enlarging the opening in the bone. The flattened point of his instrument is slipped between the bullet and the bone wall, turned so that the projecting spur of the instrument is turned against the bullet, a little below its longest diameter, and extracted without difficulty.—*Daniel La Ferté, Detroit.*

**SPLINTS FOR WAR WOUNDS OF THE EXTREMITIES.** Prof. E. Rehn. *Münch. med. Woch.*, March 7, 1916, lxiii, No. 10.

The author describes two splints originated by him during his service on the Eastern front. The first splint is for the leg in cases of gunshot or shell wounds, with severe infection and suppuration. It consists of an angular splint with an upper and a lower portion for the thigh and the lower leg, with a hinge at the knee. It has a foot support for the prevention of any equinus deformity. The whole is supported on a base board by iron rods notched at frequent intervals, so that by means of thumb screws and hinges, the angle at the knee can be easily changed. The advantages claimed for it are the ease with which the suppurating wounds can be reached for dressings and the fact that the knee can be gradually extended at each dressing, thus overcoming any flexion deformity at this joint.

The second splint is one for the upper arm wounds, with comminution of the humerus. This consists of a combined elbow, body, and shoulder support, which is well shown in the illustrations which accompany the article.—*Ralph S. Bromer, Louisville.*

**WAR ORTHOPEDICS.** Lange. *Münch. med. Woch.*, Feb. 15, 1916, p. 258.

Lange demonstrated a case in which the anterior crural nerve had been severed by gunshot. Both nerve suture, and later, obturator implantation into the anterior crural nerve by another surgeon, had been without benefit. Although sufficient time had not perhaps elapsed since these operations for final results to show, Lange believes the uncertainty of these procedures justified tendon transplantation. He therefore transplanted the tensor fascia

femoris and gracilis into the quadriceps with excellent result, the patient having full motion restored and able to walk a distance of 16 kilometers. An equally successful result was reported in a second patient, who was able to undertake long marches. In both these cases electrical stimulation of the anterior crural nerves and obturators was without effect, so that the return of function was due entirely to the transplanted muscles. In the case demonstrated the tensor fascia femoris had become markedly hypertrophied. Operative procedures in the arm are much less promising, due to the lack of available muscles. The palmaris longus, the flexor carpi radialis and the brachio radialis are the only muscles whose function can be dispensed with. In radial nerve injury, moreover, the two latter are also paralyzed, while in a median nerve injury the palmaris longus is likewise lost. The number of available muscles for transplantation might be increased by arthrodesis of the wrist joint, since wrist motion in these paralytic cases is of diminished importance. In this way all the muscles intended to move the hand would become available for transplantation into tendons controlling finger motion. The principle must be to sacrifice the less important function for the more important.

Lange also calls attention to the advantage of performing forcible manipulation of stiffened joints under the Esmarch bandage to prevent hemorrhage into the joint, and resulting increasing stiffness and pain after manipulation. He advises the use of an expulsion bandage first to remove all blood from the limb. The Esmarch applied above the expulsion bandage is left on about ten minutes after completion of the manipulation. After this period the vaso-motor control of the injured vessels is restored, and bleeding is less likely. Although forcible manipulation has come into considerable disrepute because of the many failures, Lange recommends it warmly, especially in non-infected cases, in which limitation of motion is due to contracted muscles. He claims very satisfactory results from this method in the treatment of stiffened fingers, due to long-continued fixation. Supplementary medico-mechanical treatment is necessary.—*F. J. Gaenslen, Milwaukee.*

WAR ORTHOPEDICS. Lange. *Munch. med. Woch.*, Feb. 22, 1916, p. 298.

Lange reports eight cases of arthroplasty of elbow. In two of these ankylosis was incomplete. Mobility was restricted by large callous masses on the front of the joint. The radial nerve was exposed through an external, the ulnar through an internal incision. Then the entire flexor muscle flap, including the median nerve and vessels, was raised from the front of the joint, exposing the callus. Removal of the latter is now possible. In the first case he believes he was too conservative, and no benefit resulted. In the second case 80 degrees of motion was obtained, a gain of 50 degrees. In six cases there was complete bony ankylosis. The anterior soft parts were raised as above. The triceps and anconeus flap was raised posteriorly, using Kocher's external incision. The elbow is thus freed of soft parts on all sides. The free access thus allows careful reconstruction of the joint and interposition of fat or muscles. An illustration shows one of the cases with complete extension and 120 degrees of flexion.—*F. J. Gaenslen, Milwaukee.*

WAR ORTHOPEDICS. Schede. *Munch. med. Woch.*, Feb. 22, 1916, p. 297.

The author describes an apparatus for gradual abduction of the arm in cases of stiff shoulder. The apparatus consists essentially of two parallel bars fixed to the pelvis and extending upward and outward from the body. The arm is suspended at any desired level between the bars of the appliance, which can be worn with comfort all day. The above appliance was used

with benefit in two cases of shoulder injury after forcible manipulation under anesthesia, combined in one case with camphor oil injection, and in another with tenotomy of the latissimus dorsi and teres major.—*F. J. Gaenslen, Milwaukee.*

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IDEAL FIXATION IN FIELD HOSPITALS. M. Schlichtegroll. *Münch. med. Woch.*, lxi, Feb. 22, 1916.

Schlichtegroll recommends the Cramer splint in preference to plaster of Paris, as the ideal fixation for use in the field hospitals. They are more quickly applied and are more comfortable, and can be combined with various extension appliances. The splints are not described.—*F. J. Gaenslen, Milwaukee.*

---

TREATMENT OF FRACTURED ARM IN WAR. F. v. Lesser. *Münch. med. Woch.*, Feb. 22, 1916, No. 8.

Lesser warmly recommends extension treatment in preference to all other methods in cases of gunshot fractures of arm and forearm. Extension is applied by means of stockinet bandages applied after painting the skin with adhesive liquid. The details are not described. Advantages are: the complete freedom from pain, rapid subsidence of inflammatory reaction. Combined with removable plaster splints, free access to wound is obtained. The method insures early union and restoration of function.—*F. J. Gaenslen, Milwaukee.*

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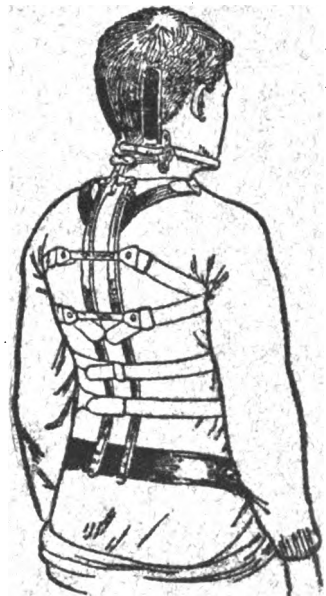
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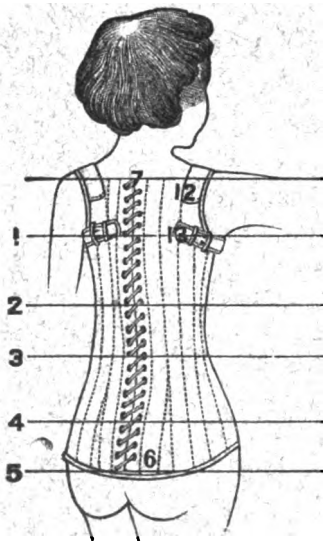
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# *The American Journal of Orthopedic Surgery*

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## Symposium on Visceroptosis as a Factor in the Causation of Orthopedic and Other Lesions

### THE ANATOMY OF VISCEROPTOSIS.

BY W. E. SULLIVAN, PH.D., BOSTON.

Tufts College Medical School, Boston.

WHILE the term visceroptosis would naturally limit the discussion to the downward displacement of the abdominal and thoracic viscera from secondary causes, it has been thought advisable to include variations in the position of the viscera from whatever cause. Only the position of the diaphragm and abdominal viscera is given in this discussion. It seems unnecessary to point out that the shape of the thorax has a direct influence on the position of the abdominal viscera. The data in this paper has been drawn to a large degree from the writings of Keith<sup>1</sup>, Potter,<sup>2</sup> and Symington.<sup>3</sup>

The proposition may be put forward as a number of questions. What is the average position of the viscera? How is that position attained? How is the average position maintained? What variations may occur? How are variations to be explained? The disposition of the viscera would involve a discussion of the development of the coelom and its contents. It does not throw enough light on the question to warrant a general discussion and may be passed over by recalling but a few of the more salient facts. The gut is at first disposed in a straight line and is suspended by a "dorsal mesentery" throughout its course. There is a subsequent increase in length, a shifting in position and a rotation to reach the position found in the adult. There are occasional adhesions of peritoneal surfaces which are in contact. The caudad migration of the diaphragm and the relation of the liver to the diaphragm during development are to be mentioned. It should be kept in mind that these changes are for the most part completed early in fetal life.

Reference has been made to comparative anatomy in the discussion of this problem. Its function in this connection is primarily as a supplement to embryology in an interpretation of the normal as well as of the variations. It is well to have in mind that the arrangement of the digestive tract in man and in the "lower forms" is such that it retards rather than facilitates the passage of food.

In the following paragraphs there is a discussion of the usual position of the viscera, what may be called normal variations, the position in ptosis, and the attachments. A general discussion of what keeps the viscera in place will be given later. For each organ there is given the vertebral level. This and the variations are from data compiled by Potter. In the arrangement of the viscera in reference to the anterior wall, data has been taken from Keith. Keith uses three planes, a sterno-ensiform, an umbilical, and a transpyloric which is midway between the other two. From Symington's admirable treatment of the viscera and the peritoneum material was taken freely.

The diaphragm has attachments to the xiphoid process, the cartilages of the seventh to twelfth ribs and the first four lumbar vertebræ, but as it arches above the points indicated it cannot receive much support in that way. It may receive support from the inferior vena cava and the pericardium. In ptosis it occupies a low position, complete expiratory position, and its muscle fibres are reduced to half their original length (Keith). The statement in regard to the muscle fibres would indicate that the diaphragm is contracted during ptosis. This would be open to question.

The liver is attached to the abdominal wall and diaphragm by the round, falciform, coronary, right triangular, and left triangular ligaments, and through the lesser omentum to the œsophagus. Its relation to the inferior vena cava and hepatic veins is important. In the upright position it rests on a shelf formed by the right kidney, hepatic flexure of the colon, stomach, first part of the duodenum, lesser omentum, pancreas, and coeliac artery. The highest point of the right lobe is at the inferior third of the ninth thoracic vertebra, but may vary from the inferior third of the seventh to the middle of the eleventh. Its anterior margin crosses the midline at the lower third of the first lumbar vertebra but varies from the superior third of the tenth thoracic vertebra to the second lumbar disc. The transverse fissure is at the level of the coeliac artery. In ptosis it may fall 50 mm. below that level.

The stomach is connected with the liver by the lesser omentum and is supported by the œsophagus and, to some degree, by the gastro-lienal ligament plus the lienophrenic ligament. Its size and position vary

with the amount of distention and the tonicity of its walls. The oesophageal orifice is usually at the superior third of the eleventh thoracic vertebra but varies from the superior third of the ninth to the middle of the twelfth. The pylorus is at the inferior two-thirds of the first lumbar. It may vary from the tenth thoracic disc to the superior third of the third lumbar vertebra. After a moderate meal, the subject standing, the stomach extends a little below the umbilicus. It may be raised 5 to 13 cm. by the contraction of the abdominal muscles or by pressure over the umbilical region.

The position of the duodenum and pancreas is relatively constant. The duodenum usually crosses the midline in front of the third lumbar vertebra, rarely the fourth and very rarely the fifth. It is attached to the liver by the hepatoduodenal ligament and to the diaphragm by its suspensory muscle. Its mesentery is obliterated early and the possibilities of variation from primary causes are slight. In ptosis it may be pushed downward by a descending liver 50 mm.

The jejunum and ileum are attached to the dorsal wall by a mesentery which runs from the left side of the body of the second lumbar vertebra to the right sacroiliac articulation. The fixation of the duodenum should be recalled and the relative fixation of the ileum mentioned. In ptosis the root of the mesentery may be displaced downward 50 mm.

The large intestine offers perhaps the greatest possibilities for variations. The lowest point of the caecum is at the second sacral disc. It varies from the fourth lumbar disc to the inferior third of the fifth sacral vertebra. The hepatic flexure of the colon is at the middle of the second lumbar vertebra but it may vary from the eleventh thoracic disc to the inferior third of the third lumbar vertebra. The splenic flexure is somewhat higher, at the middle of the twelfth thoracic but it may be as high as the ninth thoracic disc or as low as the middle of the second lumbar vertebra. The ascending colon is retroperitoneal and may have folds of the peritoneum to the body wall. The transverse colon presents for examination the transverse mesocolon, the great omentum, the hepatocolic ligament and the phrenocolic ligament. The transverse colon usually crosses the midline at the umbilicus but may cross at the ensiform process or at the pubes.

Variations in the position of the several parts of the large intestine may be reduced to four primary causes. The gut may undergo a normal rotation but the adhesions may fail. It may not rotate at all, with the result that the caecum and colon are on the left side. The rotation may be reversed. There may be a variation in the growth of one or more parts.

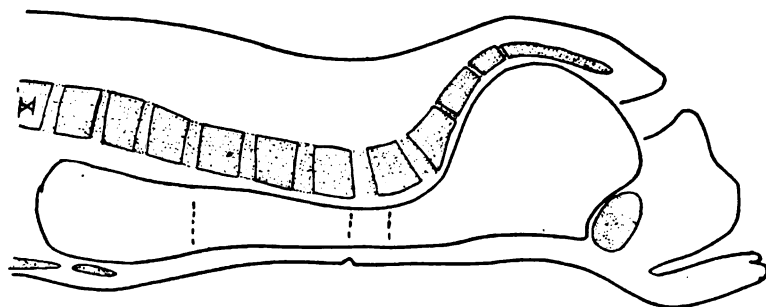


FIG. 1.

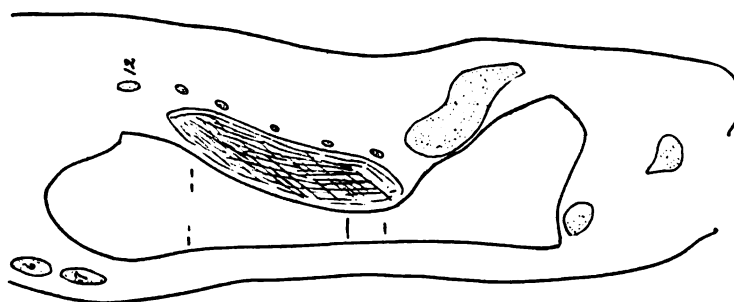


FIG. 2.

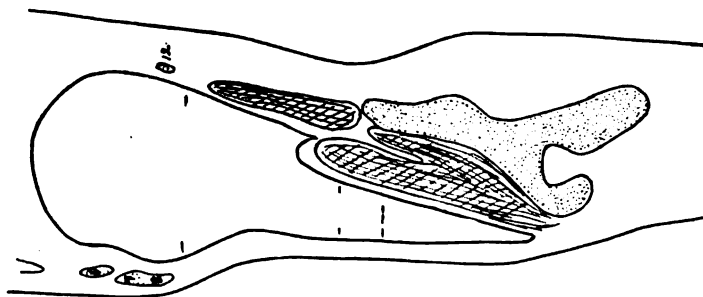


FIG. 3.

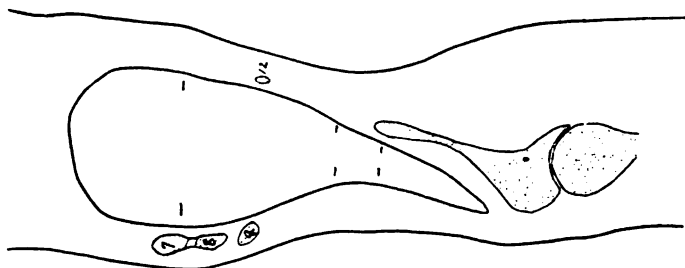


FIG. 4.

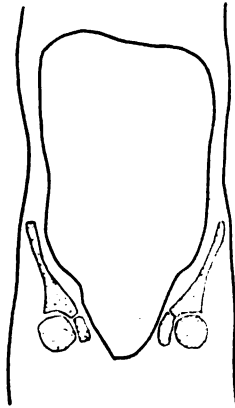


FIG. 5.

FIGS. 1, 2, 3, 4.—Sagittal sections of the abdomen and pelvis of a man aged forty years. (After Symington.)

FIG. 1 is in the median plane.

FIG. 2 is 3.5 cm. to the left of the median plane.

FIG. 3 is 6.0 cm. to the left of the median plane.

FIG. 4 is 9.0 cm. to the left of the median plane.

FIG. 5.—Coronal section of the abdomen and pelvis of a boy aged ten years. (after Symington.)

The kidneys are retroperitoneal and their ligaments may be considered as of secondary importance. The extrarenal tissue and the renal vessels should be mentioned as a means of support. The superior extremity of the right kidney is at the upper third of the twelfth thoracic vertebra but varies from the middle of the tenth thoracic to the middle of the first lumbar. The superior extremity of the left kidney is at the eleventh thoracic disc. It varies between the ninth and twelfth discs. Thompson found in an examination of 264 male subjects that the lower border of the kidney was below the iliac crest in 6; in 184 female subjects it was below in 18. The right kidney was usually lower than the left.

The shape of the abdominal cavity is most readily shown by calling attention to Figures 1 to 5. It will be seen that the skeletal elements and the psoas and iliacus muscles form "shelves" that offer a possible means of support for the viscera. The fact that the infraumbilical viscera form a possible means of support for the supraumbilical should be mentioned. The structure of the anterior and anterolateral walls, which are largely muscular, is to be noted.

Among the elements listed as being factors in the support of the viscera are the peritoneal ligaments with the blood vessels and nerves within them; the tonicity of the abdominal wall; what may be called the

"shelves" of the abdomen; atmospheric pressure and surface tension (liver to the diaphragm).

The peritoneal folds as well as the vessels and nerves within them are highly elastic and in many cases it would seem that their function, in addition to carrying the nerves and vessels, was to limit and direct the movements of the viscera rather than to give direct support. The hepatic veins and the renal vessels unquestionably assist in determining the position of the liver and kidneys. It has been suggested that atmospheric pressure is an active agent, but probably its value has been over estimated. Symington suggests that surface tension holds the liver to the diaphragm. Assuming that to be true, the question as to how the diaphragm maintains its position is raised. Does the diaphragm maintain a position independent of the organs with which it is in contact, or does it, when expanded, respond passively to a force started elsewhere and during contraction tend to assume a horizontal position? It would seem that the most effective agent in the support of the abdominal viscera is the shape of the abdominal cavity as determined by the "shelves" and by the degree of contraction or tonicity of the abdominal musculature, together with the tonicity of the viscera themselves. These factors would be supplemented by the blood vessels and ligaments in some cases and by the retroperitoneal position of the organs in others.

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## THE RÔLE OF VISCEROPTOSIS IN THE ETIOLOGY OF ARTHRITIS DEFORMANS.

BY DAVID SILVER, M.D., PITTSBURGH, PA.

VISCEROPTOSIS (splachnoptosis, enteroptosis) in its true form is now generally recognized as only one manifestation of an inherited constitutional abnormality, to which the term *habitus enteroptoticus* has been applied,<sup>1</sup> and which is characterized by a definite type of body-form. Acquired visceroptosis is less common, and the prolapse of the abdominal viscera is of much less degree than in the true variety.<sup>2</sup>

In analyzing the effect of visceroptosis on digestion and assimilation two possibilities are recognized: first, alterations in the secretions of the various organs from interference with their circulatory and nervous systems,<sup>3</sup> producing both local and, in the case of internal secretions, possibly remote effects; and second, delay in the passage of the intestinal contents. Both of these favor increased bacterial growth and an ascent of bacteria into the upper intestinal tract, where they are normally few.<sup>4</sup> Whether this same interference with the circulatory and nervous systems may also so influence the function of the solid viscera as to impair their action in the body-protective mechanism seems worth consideration.

Leaving out of the question, however, its influence on glandular secretions, the chief effect of visceroptosis, which our present knowledge enables us to discuss with understanding and profit, consists in the production of intestinal stasis and consequent toxemia. Continued study of the visceroptotic type of individual, particularly from the roentgenographic standpoint, has increased enormously our knowledge of the relation between morphology and function of the alimentary canal; so that we now know that visceroptosis, to even a marked degree, may exist with apparently normal digestion and assimilation, the ratio between the intestinal stasis and the patient's resisting powers determining whether or not he will show signs of toxemia.<sup>5</sup> Further, since stasis may result independently of visceroptosis, and toxemia may occur without stasis, the question to be now considered becomes rather one of the relation of alimentary toxemia to arthritis deformans.

Briefly defined, arthritis deformans (rheumatoid arthritis, chronic polyarthritis) is a disease of complex etiology; many causes are active in its inception, and, similarly, after it has once begun, many causes play a part in perpetuating it. That certain individuals possess a lessened joint resistance, either hereditary or acquired, seems a necessary



assumption. It is also evident that anything which lowers nerve tone or affects the quality or the quantity of the blood supply to the joints<sup>6</sup> acts still further to impair joint vitality, and so predisposes to the development of joint disease. So far as our present knowledge goes, the accumulating evidence points very strongly to some focal infection as the exciting cause, at least in the great majority of the cases, and particularly to an infection from the mucous membranes.<sup>7</sup> It is recognized also that arthritis deformans is a disabling and debilitating disease; practically every function of the body suffers to a greater or lesser degree. Such patients, therefore, are necessarily more prone to infections of various types and in various locations, while the general emaciation and loss of muscular tone naturally permit of some prolapse of the abdominal organs and more or less stasis. Hence a given focal infection or some degree of visceroptosis may be entirely secondary to the arthritis, although of importance in perpetuating it.

It may be assumed as granted, therefore, that in many cases in which visceroptosis and arthritis co-exist, the former is of the secondary acquired type; further that in any case of the primary type in which the visceroptosis interferes with the function of the alimentary canal, it necessarily plays some part in lowering general resistance, and so acts as *one* predisposing factor. It may even be granted that the alimentary toxemia thus induced may occasionally be the *deciding* predisposing factor, in the sense claimed by Lane, in that it may so reduce vital resistance that chronic foci of infection, otherwise latent, become active. The questions left for consideration then are: (1) how frequently alimentary toxemia may act as such deciding factor, and (2) whether it may ever be the *chief* factor in the production of arthritis deformans,—that is, what evidence have we that the toxins, chemical or bacterial, thus enabled to enter the circulation, may directly induce joint change? These questions may be considered under two heads: (A) laboratory evidence, and (B) clinical evidence.

LABORATORY EVIDENCE. The possibilities connected with absorption from the intestines have been well discussed by Adami,<sup>8</sup> by Wooley,<sup>9</sup> and by Brown.<sup>10</sup> Wooley has divided these possibilities into five groups, which are:

A. "That during digestion of food materials by the normal secretions of the gastro-intestinal tract, toxic substances may enter the blood stream and produce serious disorders."

B. "That bacteria resident in the intestinal tract act upon the foodstuffs and produce toxic substances, which are absorbed, and act as intoxicants."

C. "That the presence of bacteria themselves, which have entered the blood-stream from the intestine, are the source of trouble."

D. "The possibility suggested by Eppinger and Gutman that many of the substances which pass the intestinal walls are hormones, which produce effects in the tissues in the same manner as do the active components of the internal secretions, so that they would conceive of the intestines playing a rôle somewhat similar to that of the ductless glands."

E. That several of the previously mentioned possibilities occur together.

As far as the two first of these possibilities are concerned, a satisfactory discussion would require far more time than can now be devoted to this phase of the question. Let it suffice that both Adami and Wooley conclude from their studies of the subject that, in the light of our present knowledge, there are as yet no solid grounds for claiming that the absorption of split-products are the cause of the symptoms ascribed by Lane to stasis, although they do not deny the possibility, nor that such products may play a part. Adami points out that there is still lacking, however, any thorough study upon the effects of entry into the system of minimal recurrent doses of bodies of this (split-product) order.

The third possibility demands more extended notice, especially since it seems more in keeping with what we already know of joint disease. The importance of the intestinal canal as a portal of entry into the system of pathogenic organisms is being more and more clearly recognized. "Normally," says Adami,<sup>11</sup> "the taking in of bacteria is relatively slight, and the exercise of what are strictly the physiological functions of the cells in bringing about the destruction of the same, leads to no disturbance, either local or general." Under certain conditions, however, this taking in of bacteria may be greatly increased, and then "the effects of such continued passage of considerable numbers of bacteria into the system must be equivalent to the growth of the same within the tissues, and their destruction, if long continued and excessive, should bring on cell exhaustion." To this process he has applied the now well-known term of "subinfection," which he defines as a process in which the tissues readily destroy the invading bacteria, but in which, just as water constantly dropping makes a hole in the stone, eventually, with recurrent invasion, the tissues become worn out, whereupon chronic or acute infection may supervene. Adami<sup>12</sup> also calls attention to the fact that in the lower portion of the small intestine, the region where the proliferation of bacteria attains its maximum, the

lymph-glandular tissue is most extensive, which tissue has been shown (in the rabbit) to be identical with that seen in the tonsil.

"Many investigators have demonstrated by experiments the comparative ease with which organisms pass from the intestinal canal of animals into the blood-stream and the organs of the body," and numerous observers "have shown that various methods of lowering resistance by heat, cold, inanition, over-exertion, injection of toxins, hypertonic solutions, dilute acids, and other conditions, lead to a bacteremia."<sup>13</sup>

Mutch,<sup>14</sup> who has recently reported a study of the "bacterial activity of the alimentary tract," the expense of his researches being in part defrayed by a grant from the British Medical Association, says: "Secondary intestinal infections, in which less usual organisms are found in the ileum, in addition to those commonly present in intestinal stasis, probably give rise to many symptoms which must be ascribed to the action of bacterial toxins rather than to food decomposition-products; the most clearly proved instance of such a secondary infection spreading from the ileum to the more distant tissues is the chronic multiple arthritis known as Still's disease." He then cites a case of Lane's, to be mentioned later, in which staphylococcus citreus was found in the blood cultures and in ileal swabs taken at operation.

In considering the varieties of bacteria found in the intestinal canal, it seems at least highly suggestive that the streptococcus, which has apparently been demonstrated, both experimentally and clinically,<sup>15</sup> as capable of producing the lesions of arthritis deformans, and which most of us, no doubt, agree is the organism probably most commonly concerned in the production of this disease, should be met with so frequently; in the cecum and colon, supremacy in numbers is divided between the streptococci and members of the colon group, sometimes one and sometimes the other predominating.<sup>16</sup> Since the changes in the intestinal wall in stasis vary from a mild inflammation to actual ulceration, it is obviously possible for the bacteria to develop in the wall, and even multiply in the glandular tissue of the mucosa, much as in that of the tonsil.

Rea Smith<sup>17</sup> has made bacteriological examinations of the walls of the ileum and colon in two cases, and of the ileum alone in a third case, in patients with arthritis deformans; the mucous membrane was stripped off, the wall macerated and cultures made. In the first case a growth of streptococcus viridans was obtained from both ileum and colon, in the ileum this being the predominating organism, while in the colon the colonies were scattered; in the other cases a hemolyzing streptococcus was grown. Cultures from the walls of three colons, removed

for other causes than arthritis, showed no viridans, but two showed hemolyzing streptococci.\*

But whatever the character of the toxin, in the last analysis the development of toxemia rests with the body-protective mechanism, so that it may be stated that symptoms of toxemia will result—

(1) If the quantity of toxin, bacterial or chemical, which enters the system, is in excess of that which can be neutralized by the protective mechanism;

(2) If the amount is such that it can be neutralized only by calling out all the resources of the protective mechanism, so that after a period cell exhaustion results;

(3) If the protective mechanism is already defective from causes independent of the digestive system.

CLINICAL EVIDENCE. Turning now to clinical evidence, it is at least significant that, in view of the probable large number of cases which must have been operated upon under the stimulus of Mr. Lane's enthusiastic reports, so few end-results are available in literature. Undoubtedly the most important contribution is that of Fagge and Hughes,<sup>19</sup> who have recently reported their "analysis of a consecutive series of cases of various forms of arthritis, treated by ileocolostomy and colectomy," and who state that they "have had access to the notes of all such cases operated on by Sir Arbuthnot Lane, either in Guy's or Great Ormond Street Hospital, between 1909 and August, 1914." Out of thirty-three cases operated upon, twenty-three are reported as cases of tuberculous joint disease, three of Still's disease, and seven of multiple arthritis, apparently rheumatoid.

Of the three cases of Still's disease, "one died after readmission for acute intestinal obstruction with gangrene of the small intestine; one has been lost sight of; a third was seen at Guy's in August, 1914."

The patient was a boy of five years, who had had the disease for two years; the diagnosis was concurred in by Still, and a fatal termination predicted under ordinary measures. *Staphylococcus citreus* had been found in the blood, and an ileal swab at operation showed the same organism. An ileocolostomy was first performed, and eight months later a colectomy. Examined fifteen months after his second operation, his condition is described as very satisfactory; "while he seemed to be a delicate child, he walked about fairly actively and was attending school; the joints were still enlarged but not tender."

\* In further support of an intestinal portal of entry of bacteria in arthritis may be cited those cases in which joint involvement has followed ulceration of the rectum.<sup>20</sup>

Of the seven cases classed together as examples of multiple arthritis, one died and one was lost sight of. In two of the remaining five, the period of observation was obviously too short for any opinion of value, one having been seen by Fagge and Hughes only fifteen days after operation and the other two months, although in both they have noted some improvement. The three available cases may be briefly summarized as follows:

Female, aged 10 years, had been affected for eighteen months, and nearly all the joints were involved, some being ankylosed, although there was comparatively little swelling. Ileocolostomy was performed. Marked improvement was recorded after six months, and after nearly three years she is reported as "excellent in every way and having complete mobility of every joint, except those which were the seat of bony ankylosis.

Female, aged 44 years, had been affected for five months, but the right knee was the only joint showing actual change. Colectomy was performed, apparently on account of other conditions. After sixteen months, the knee joint was reported as practically normal, but she still wore a splint.

Female, aged 24 years, had been affected in both knees for two years. Ileocolostomy was performed. The report of the examination made over two and a half years after operation says,—“Now grating in both knees. Movements perfect and painless except occasionally. Right knee no better and no worse since operation, but the left knee is quite well now. Right hip hurts when she lies on it.”

The report of this series of Mr. Lane's cases is distinctly disappointing, as it is open to a number of criticisms which seriously impair its scientific value: the case histories are insufficient for an accurate estimation of the character and severity of the joint changes; no detailed report of blood and other findings is given; the number of cases of multiple arthritis is small, and the question as to whether the results claimed for operation are any better than those following non-operative procedures is, with possibly two exceptions, at least debatable. Moreover, the claim that the “abrupt and conspicuous change, following within a few days and even hours, an ileocolostomy,”<sup>20</sup> should be the result of the operation alone, would appear untenable. According to Mr. Lane's theory of chronic intestinal stasis, as generally understood, rheumatoid arthritis is an indirect, not a direct, result of the auto-intoxication, which acts to lower the resisting power of the tissues to the entry of organisms. If this be the case, it would hardly be expected that the removal of a predisposing factor, even though the chief one, could yield such immediate improvement. If, on the other hand, his theory is incorrect, and the trouble is the result of infection entering through the inflamed intestinal wall, any operation short of removal of the depraved membrane would not be expected to yield speedy or per-

manent improvement, nor is it in accord with experience in cases where a chronic focus of infection has been found and removed. It seems reasonable to assume that this sudden early change is probably merely the same which has already been noted as often following ether anesthesia.<sup>21</sup>

The only other series of cases which I have been able to find is that reported by Rea Smith,<sup>22</sup> who has operated upon fourteen patients with frank arthritis deformans. The detailed report of these cases has, I believe, not yet appeared, but it is to be hoped that it will be published, and also that the history of these cases at a still later period will be given. This series may be briefly summarized as follows:

In two cases both ileocolostomy and colectomy were done at one operation, and both patients "were markedly benefited from the point of view of their disease." Of the remaining twelve, on whom short-circuiting operations were done, in five the joint symptoms disappeared, three of them being able to resume their occupations, with little or no pain, and much less disability than would have seemed possible from their previous condition; the remaining six all made an early improvement but relapsed to their former condition in a few weeks. Four of these six had a secondary colectomy; of these one was a failure, being no better after six months than before short-circuiting, while three were greatly improved, the disease having been arrested, and the patients able to walk without assistance.

Smith concludes that the portal of entrance of the streptococcus, in all the cases of chronic arthritis that he has had an opportunity of studying, is the ilocecal coil, and the stasis in the terminal ileum is the predisposing cause. It is of interest to contrast with this opinion of Smith from the surgical standpoint that of Billings<sup>23</sup> from the medical side; the latter concludes from his experience that the infectious source is usually located in the mouth, faucial tonsils or antra, and only occasionally elsewhere, while he considers it still open to question whether the infection may occur from a chronic streptococcus infection of the intestines.

Moynihan,<sup>24</sup> although presenting no report of cases, states his opinion very clearly: "Probably every surgeon," he says, "knows something of chronic joint diseases which undergo striking improvement when factories of infection are closed down. I have cured not a few cases of rheumatoid arthritis by draining the gall-bladder, which produced the poisons to which the joints reacted. Of the occurrence of a few equal improvements after colectomy I am fully cognizant; but I am also aware of many cases that have showed little or no permanent improvement. . .

The evidence at the moment available allows us certainly to say that intestinal stasis does seem to stand in a causal relationship toward some cases of chronic joint affections, and that such cases exhibit a marked and instantaneous delay or even cessation in the destructive processes after operation upon the bowel, and that a complete recovery of the joint ultimately occurs. What is uncertain is not the existence of such cases, but their frequency."

This statement of Moynihan seems as much as our present knowledge of the subject enables us to claim. If we are to reach any definite conclusion as to the relative frequency of the intestinal origin of arthritis deformans, a more careful study and detailed report of the cases are essential; in a disease so complex in its etiology and often so irregular in its course, it seems not too much to ask that the case history be complete enough for the result to be judged on its merits. Among the points often overlooked, to judge from the histories available in literature, may be mentioned: (1) the sequence in time of development of the various questionable factors, to determine which are primary and which secondary<sup>25</sup>; (2) whether visceroptosis, when present, is of the true or acquired variety; (3) the character and extent of the joint changes, as shown by both clinical and roentgenographic examination; (4) the time of occurrence and duration of any remissions in symptoms; (5) the immediate and final effect of the various methods of treatment. A more extended period of observation before the report is made appears, moreover, highly desirable in order that a remission in symptoms or a temporary improvement may not be mistaken for a permanent cure.

There seems also to be a need of a better realization of what may reasonably be expected from the different operations upon the intestinal canal. Since the changes in the colon may reach such a degree that it can never again become a useful organ,<sup>26</sup> the failure of an ileocolostomy in a given case cannot be held as proof against the intestinal origin of the arthritis, as under such conditions nothing short of a colectomy could be expected to yield a definite result. Further, if, as seems likely, other factors than stasis are active in true visceroptosis, then even a colectomy does not meet all indications. Again, if we accept the bacterial nature of the toxemia, it is obvious that the mesenteric and retroperitoneal glands may harbor the infection for a long time, or that the bacteria themselves may reach the joint tissues and persist there, a cure in both instances being thus long deferred.

CONCLUSIONS. It seems to have been demonstrated that the active agent in arthritis deformans may enter through the intestinal tract. This active agent is undoubtedly bacterial, probably most commonly

streptococcic, and the intestinal mucosa is thus to be regarded as one of a number of mucous surfaces through which infection may enter the system. Through the production of stasis, and probably also, through its influence on glandular secretions, visceroptosis acts to cause increased intestinal infection, and so favors systemic invasion; thus in an individual with lessened joint resistance it may be the deciding factor in the development of arthritis. How frequently arthritis develops in visceroptotic subjects, and what the proportion is between the number of cases of arthritis due to this cause and that arising from other intestinal affections, cannot now be stated.

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## MEDICAL ASPECTS OF VISCEROPTOSIS.

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NO RELIABLE INFERENCES REGARDING THE FUNCTION OF THE STOMACH CAN BE DRAWN FROM ITS POSITION IN THE ABDOMINAL CAVITY.

By gastro-enterologists it is universally conceded that even most pronounced degrees of ptosis may coexist with perfectly normal function.

Stockton says that gastropptosis is usually unaccompanied by symptoms sufficiently specific to lead one to suspect its presence. R. H. Smith says that "many enteropptotic women, even when the prolapse is great, have good digestion and are free from symptoms." Otto Strauss<sup>1</sup> says that, in contrast to the atonic stomach, the prolapsed stomach often shows very good tonus; in the majority of cases it exhibits well-developed peristalsis, and very often empties itself in the same time as a normal stomach. Similar quotations could be cited in an unlimited number.

Conceding that many prolapsed stomachs functionate normally, what can we say concerning the many prolapsed stomachs which functionate badly? Let us hear what an X-ray specialist has to say on this subject. In an article on the "X-ray Diagnosis of Gastropptosis," H. K. Pancoast declares as follows: "Knowing that an apparent ptosis may exist without symptoms, given a case of suspected gastropptosis, the roentgenologist first determines whether the typical roentgen picture is present; he then observes the extent of the ptosis, the degree of atony and the delay in the time of clearance. Next he must be assured that the position of the stomach is not due to extra-gastric causes. Then he determines whether the atony and dilatation and the other factors in retention are those truly associated with a gastropptosis, *or arise from other causes*. Finally, it is important to examine the intestinal tract, because of the possible factors to be found in them." (This quotation is curtailed and paraphrased, but substantially accurate.) Now, such an exposition is little less than a *reductio ad absurdum*. We might as well say that if no other causes produce symptoms in a prolapsed stomach, possibly the prolapse itself produces them. *In other words, the position of the stomach "per se" teaches us nothing regarding its function.*

## THE POSITION OF THE COLON TEACHES US NOTHING REGARDING ITS FUNCTION.

Roentgenologists have known for a long time that in the same individual the transverse colon can assume different forms and positions at different times.<sup>1</sup>

J. T. Case<sup>2</sup> informs us that within five or six hours the transverse colon may assume half a dozen different shapes; that the level reached by the lowest border of the transverse colon varies considerably in different patients, as well as at different times in the same patient. In tall, slender individuals, the lower border of the transverse colon normally may reach several inches below the line joining the iliac crests, although in the same type of individual the transverse colon may lie well above the navel when the patient lies supine. He says further that "stasis in a prolapsed transverse colon is practically never encountered,"<sup>3</sup> and that he does not seriously consider ptosis of the transverse colon as a cause of constipation. Hopmann<sup>4</sup> says that in many cases of prolapsed abdominal viscera the evacuations are perfectly normal.

No competent internist or roentgenologist any longer accepts the crude notion that prolapse of the colon produces kinks along its course, and that these kinks form obstructions and produce stasis. In the first place the apparent kinking in the roentgenogram is obviously an illusion due to one plane photography, and this illusion is easily dispelled by stereoscopic pictures. Keith<sup>5</sup> calls attention to the fact that there is no hypertrophy of the muscular coats above the site of so-called bands or kinks, and that when acute flexures are produced experimentally (Murphy and Cannon) stasis does not result. Case says there is rarely any real kinking in the colon, even when adhesions are numerous.

A movable cecum (which is often discussed in connection with coloptosis) is considered by many competent authorities, both medical and surgical, to be a normal condition.<sup>6</sup>

Finally, when we consider the normal physiological mechanism by which the contents of the colon are pushed forward; the powerful colonic contractions, which in the course of a few seconds propel large columns of colonic contents onward a distance of six to twelve inches, or even further; how the column moves up hill and down dale with equal speed and facility, i.e., up the ascending loop of the transverse colon and around the splenic flexure; when we recall, furthermore, that the colon has muscular fibres calculated to be as voluminous as in the biceps of a blacksmith's arm, we must conclude that variations in position of and by themselves can have little, if any, effect on the normal function of the colon.

THE POSITION OF THE RIGHT KIDNEY IS OF IMPORTANCE ONLY WHEN IT  
PRODUCES LOCAL SYMPTOMS.

Moderate displacements of the right kidney are no longer considered pathological (Israel, Litten, Kuttner). Even patients with marked nephroptosis may have no symptoms. So much harm has been done to patients in the past by riveting their attention on the position of the kidneys, that all clinicians (both internists and surgeons) in recent writings warn us against communicating our knowledge concerning the position of their kidneys to our patients unless definite local symptoms are present, such as colicky or dragging pains, hematuria or Dietl's crises. Forchheimer<sup>7</sup> says that many a patient has been made an invalid by failure to heed this precaution. Sailer thinks, in fact, that the only definite symptom surely referable to nephroptosis is the Dietl crisis.<sup>8</sup>

THE CLASSIFICATION OF CASES OF VISCEROPTOSIS.

Bearing the above facts in mind, I believe it is fundamentally wrong to classify the cases of visceroptosis clinically, according to the static conditions presented, instead of according to their symptomatology. A useful clinical classification should divide cases of visceroptosis into three groups.

Group 1. One or more organs are prolapsed, but the individual is in good health.

Group 2. The individual is sick and has prolapse of one or more organs, but can be relieved without reference to the ptosis.

Group 3. *The patient has symptoms which cannot be relieved without special attention being given to the displacement of the abdominal organs and to the conditions which underlie and occasion them.*

Basing my conclusions upon clinical experience over a long period of years, I should say unhesitatingly that the third group, which should form the real and only basis for our discussion, is by far the smallest of the three groups. Failure to recognize this fact renders much of the current literature on visceroptosis, not only futile, but even harmful. To consider visceroptosis a clinical entity of and by itself is to mislead the inexperienced clinician; is to arm the roentgenologist with a facile instrument of often unintentional deception; is to tempt the ambitious surgeon into fields of action in which he can do much harm, and is to lead even many experienced clinicians far afield into ill-considered generalizations and lines of action.

It should be emphasized over and over again that static conditions as such can never be a criterion of disease; that our health depends not on anatomical relationships, but on function; and that he would be a bold clinician, indeed, who would venture to make emphatic deductions concerning the functions of an abdominal organ, from its shape and position alone.

The usual custom of separating cases of visceroptosis into two groups, the congenital and the acquired, has many features of practical utility.

The word congenital, of course, is in one sense a misnomer. The ptosis is not inherited, but merely the predisposition thereto. Neither the stomach, the colon nor the kidney is actually prolapsed before the age of puberty. At that period, according to R. H. Smith, there is a widening of the pelvis and a compensatory narrowing of the waist. In the thin, relaxed and badly nourished child these changes are pronounced, and prolapse of the kidney and the pyloric end of the stomach occur, along with other changes. Smith<sup>9</sup> says that the state of nutrition during adolescence, more than any other cause, influences the size and form of the chest and upper abdomen and that, once established, these do not change materially during life. The congenital type presents many other stigmata, which will be referred to later.

Again quoting Smith, we can describe the acquired type as it occurs in women who during childhood and adolescence were well nourished, sturdy of form, firm of tissue, and who had deep chests, capacious upper abdomens and retentive abdominal walls. Through the weakening effects of child-bearing, fatigue, overwork, or other physical or mental strain, these women may acquire more or less relaxation of tissues, a changed configuration of the body, and a certain degree of visceral prolapse. As a rule, the degree of prolapse is less in this type than in the congenital, but the symptoms may be quite as distressing. While the pronounced types of the congenital and acquired groups can be readily distinguished, there are naturally many mixed types which it is impossible to classify. In general terms we can say that the acquired types can usually be markedly benefited by hygienic and other measures, but that members of the congenital group can usually not be radically and permanently improved.

THE SO-CALLED CASES OF CONGENITAL VISCEROPTOSIS SHOULD NOT BE CLASSIFIED AS CASES OF VISCEROPTOSIS AT ALL.

It is an interesting commentary on our methods of thinking to note that, whereas congenital visceroptosis was long ago recognized as only

a part, and not always an essential or even an important part, of a condition of general constitutional asthenia, we have, nevertheless, retained the term visceroptosis as a designation for the entire condition. In 1899 Stiller invented the term, "*asthenia universalis congenita*," to describe what we still call congenital visceroptosis, and the same year H. Strauss spoke of this condition as *a coördinated expression of the constitutional inferiority, "minderwertigkeit," of various organs*. The term "*habitus asthenicus*," or constitutional asthenia, has since then also become prevalent.

The essential truthfulness of Stiller's presentation, as applied to a certain large group of cases, is generally accepted. I shall not take up your time by going over this well-known ground. Stiller laid especial stress on the long, narrow, flat thorax, the small bones, the slight panniculus adiposus, the mobile tenth rib, and what he called a vulnerable nervous system. His general conclusion has met with practically universal acceptance, viz: that the symptoms in this type of visceroptosis are not due so much to the visceral displacement as to the vitiated muscular and nervous system of the individual.

Intensive study of the "*habitus asthenicus*" has disclosed other constituent elements. Among the congenital defects of development<sup>10</sup> are: failure of the colon to rotate completely into the right flank; failure of complete fusion between the right meso-colon and the posterior parietal peritoneum, resulting in cecum mobile (Wilms); failure of the layers of the great omentum to fuse. Goldthwait<sup>11</sup> lays emphasis on the smallness of the spine, and the deformity of the lumbar vertebrae. He also accepts, as quite characteristic for this type, an abnormal shortness of the large and small intestines. He calls attention to the undersized heart, the small lungs, the slender feet with their unnaturally high arches. Other writers have noted that in this type the female genitalia are often poorly developed.

To the study of structure has been added the study of function. It has been found that in children of this build orthostatic albuminuria is not uncommon; weak digestion and constipation are prevalent, and Uhlman has recently demonstrated that the liver in these subjects is physiologically inferior (as determined by the ready appearance of galactosuria after the administration of 30 g. galactose.<sup>12</sup>

As many of these patients show a lessened reaction to pilocarpin, i.e., a certain grade of sympatheticotonia, it is possible that the lessened hepatic function indicates a vitiated nervous system.

When we sum up these observations we find that we have gathered into one group certain individuals of a particular body-form or *habitus*

who are apt to present some or many of the following characteristics: a vulnerable nervous system of neurasthenic type; a weak muscular system; certain skeletal defects; physiologically weak heart, kidneys, liver and digestive organs; displacement of one or more abdominal viscera. Chiefly through custom, we still refer to these patients as being "cases of visceroptosis," although the malposition of the abdominal viscera is only one item out of many; is, in fact, not always present; frequently does not play an important part in the symptomatology, and may easily become a misleading factor in the treatment if an undue amount of attention is paid to it. The error is commonly made of ascribing off-hand any existing digestive disorders to the ptosis as such; especially to assume that the constipation is the obvious result of the prolapse (although we know that prolapse of and by itself does not produce constipation), and to direct all our therapeutic efforts to changing the position of the viscera by bandages, rest cures, and finally by operative procedures. It would be a great advance if we dropped the term visceroptosis or splanchnoptosis when referring to these cases. The designation, *habitus asthenicus*, is preferable and not misleading. With still more reluctance should we be willing to speak of these patients as "macroscyles" or "hyperontomorphs."

As a matter of practice we are usually led into error when we treat our patients not as individuals, but as members of a group. Nothing is so easy as the making of sweeping generalizations, and nothing is more misleading. It may often prove useful to recognize the fact that our patient belongs to a general class, but to speak of him, without first dissecting him, as a carnivorous or an herbivorous type, to posit for him certain potentials of disease, to try for the good of the race to eradicate him, is in no sense a progress in scientific medicine, but rather a reversion to the era of Galenic dyscrasiae,—before we knew that streptococci and not humors caused gall-bladder infection and tonsillitis. No one can read critically the anatomic studies underlying the classification of human beings into herbivorae, hyperontomorphs and meso-ontomorphs without realizing what leaps the imagination is compelled to make and what violence must be done to careful and individual observation.

THE ACQUIRED FORM OF VISCEROPTOSIS IS THE ONLY CLINICAL FORM OF VISCEROPTOSIS AS SUCH.

Visceroptosis is acquired in many ways. The first causes to be accurately studied were those involving some damage to the supporting structures of the abdominal viscera. Whatever theories we hold regard-

ing the manner in which the abdominal organs are held in position normally, we all recognize the fact that in order to maintain this position there must be a state of equilibrium between the volume of the abdominal cavity and its contents. This equilibrium can be destroyed by increasing the volume of the cavity (as in laxity of the abdominal walls, and rupture of the perineum) or by diminishing the volume of the contents, as in wasting diseases, malnutrition (Glenard). Both factors may work together. What rôle is played by the suspensory ligaments of the organs and the so-called intra-abdominal pressure is still problematic.

Wiedkopf<sup>14</sup> has very graphically described the development and symptomatology of visceroptosis when acquired as the result of weakening of the anterior abdominal walls. Thus repeated pregnancies weaken the walls; the abdominal cavity becomes too large for its contents; the small intestine sinks; the stomach, transverse colon and right kidney follow. Now for the first time these organs actually become suspended from their supporting ligaments and drag on them. Eating causes increase of the drag, and so does overfilling of the colon (constipation). The quantity of the food taken (Rovsing) is of more importance than its quality. Lying down lessens the drag and the symptoms. The lower abdomen bulges; the upper abdomen is retracted. Wearing an abdominal support gives relief. All this is simple and obvious enough and a matter of daily observation.

The orthopedic surgeons, under the lead of Goldthwait, have shown us the frequent dependence of visceroptosis on bad posture, *i.e.*, a relaxed position of the trunk. Bad posture depresses the position of the diaphragm, relaxes the abdominal walls and forces the abdominal contents downward and forward. Habitual bad posture tends to render the ptosis chronic and to cause other structural changes which I shall not repeat here.

The question which naturally arises is, What causes the bad posture? The answer is equally obvious. Bad nutrition, sickness, overwork, overstrain, a mal-adjusted psychology, discouragement. These cause the letting-go of the voluntary muscles, the atonic state of involuntary muscles. The downward drag and the unnatural pressure in turn produce effects on distant structures; the patients develop lumbago, sciatica, villous arthritis of the knee. One would think the process would end there. The health becomes depraved, the organs functionate badly and pain occurs in many areas. But no! In the visceroptotic individual chronic disease of the kidney, arteriosclerosis, diabetes, constant high blood pressure, sclerosis of the liver, gallstones and acid indigestion

are frequently seen. In 1914 Goldthwait<sup>14</sup> hesitated to suggest that the above mechanical conditions could lead to these diseases (a natural hesitation); yet in the Shattuck Lecture for 1915 he suggests that the position of the spleen may induce the profound anemias (p. 52); a kink in the bowel may cause an eye infection (p. 54); a glycosuria be caused by mechanical pressure on the pancreas (p. 51); epilepsy be the result of enteroptosis. On page 52 we are told that the pelvic organs cannot work rightly if the loose abdominal organs are crowded into the lower abdomen and pelvis, and on page 54 we learn that in the carnivorous type (the type in which the most pronounced ptoses occur) conception occurs easily and large families are common. No! a mechanistic conception of disease is helpful only so far as it clings to facts which can be established by observation. It becomes fantastic and leads far afield when it outstrips fact and gives rein to imagination. After all is said and done, the patient is always an individual with individual problems to solve. To call him names does not help him. If the abdominal muscles are weak, if a prolapsed stomach functionates badly, the fact must be determined by observation.

If a woman's torn perineum causes dyschezia and the constipation leads to headache and nervous disturbances, these facts must be determined for her on the merits of her own case. Are your patient's symptoms the result of anatomical abnormalities, flat-foot, coloptosis, relaxed posture, or are they due to fatigue, unhappiness, strain, undernourishment? The discovery of anatomical abnormalities does not answer the question; it only propounds it more sharply.

"Jede Menschen Sorge ist Individual-sorge," said Pestalozzi. It is well to remember that every patient's problems are his very own.

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## VISCEROPTOSIS FROM THE RADIOGRAPHER'S VIEWPOINT.

BY FRED H. BAETJER, M.D., BALTIMORE, MD.

SOMETIME ago I received a communication from the president of the American Orthopedic Association asking me for a definition of visceroptosis. I am perfectly frank to confess that I neglected replying to his communication because I could not give a definition of visceroptosis.

It seems to me that this term is one of the most abused in medical literature. It has been my good fortune to make a great many gastro-intestinal examinations, and in studying these cases one is forced to conclude that the physiological normal, which we see described and which has been taught us in the medical schools, is not the physiological normal that we meet with in actual experience.

In our notes upon the results of several thousand cases of gastro-intestinal examinations we have been struck with the fact that the term visceroptosis is entirely a relative one. It has seemed to us that we may have a normal visceroptosis and a pathological visceroptosis. By the normal visceroptosis we mean variation from the accepted position of the gastro-intestinal tract, and yet one functioning normally. By a pathological visceroptosis we mean one that departs from our normal standard, and at the same time does not function properly on account of its position.

It has been our custom to make all of our examinations in the prone position to determine what we term the true degree of prolapse. We have found that when the patient is examined in the erect position there is practically always a certain amount of visceroptosis. In those patients in whom there is only a slight degree when examined in the erect position, we find that when examined in the prone position the organs return to nearly the normal position. Of course we realize that the prone position is not the ordinary position which the patient assumes, but we have simply employed this position as a method of standardization, as it were.

If we accept as normal the fact that the so-called normal stomach is cow-horn in shape, that its greater curvature reaches the umbilicus, that the cecum is just below the brim of the pelvis, that the hepatic flexure is just below the angle of the rib, and from that point the transverse colon runs across the abdomen and slightly upwards to the splenic flexure and from there drops down to the sigmoid, and then finally to the rectum, we are forced to conclude that practically every individual

who is below a certain weight has visceroptosis, from the anatomical standpoint.

In a study of all gastro-intestinal cases that have come under our observation we have divided them roughly into three types:

Type 1,—weighing 150 pounds or more. This type invariably presents a condition where the stomach is high up in the abdomen, occupying a transverse position; pylorus and duodenum to the right of the median line, and the greater curvature of the stomach  $1\frac{1}{2}$  to 2 inches above the umbilicus; the large bowel occupying the normally accepted position, that is, the hepatic and splenic flexures being in place and the colon running obliquely between them.

Type 2. Individuals weighing around 125 pounds. The stomach is of the cow-horn variety, lying well over to the left side; pylorus and duodenum being in the median line or just a trifle to the right, and the greater curvature of the stomach lying at the umbilicus or just below it. The transverse colon is slightly down and running transversely across the abdomen just below the greater curvature, the hepatic flexure also being a little below the accepted normal position.

In Type 3, where the individual weighs 110 pounds or under, we find a stomach which is fish-hook in character, lying entirely to the left of the median line, the fundus being at or generally below the crest of the ilium. The hepatic flexure is pulled way down, lying about  $1\frac{1}{2}$  to 2 inches above the brim of the pelvis and the transverse colon lying either along the crest of the ilium or down in the pelvis.

Of these three types, not one of them conforms to the so-called physiological normal. In Type 1, the stomach is too high, but the colon is in normal position. In Type 2, the stomach would be the accepted normal, but the colon is out of position. In Type 3, both stomach and colon do not come up to the accepted standards.

Now these three types are practically fixed and constant, and one has only to observe a great number of cases to see how true these run to standard. When we have a variation from these standards, and when the weight of the individual is taken into consideration, we are then dealing with a true pathological condition. In Type 1 we never see visceroptosis unless we are dealing with a true pathological condition. In Type 2 the condition may be due to a visceroptosis producing symptoms, or it may be normal in functioning. Type 3 is always a visceroptosis anatomically, but it may be normal physiologically.

The question now arises as to what part, if any, these so-called visceroptotic conditions play in the production of pathological changes or strains upon the vertebral column. It has always seemed to me that

the cause and effect are not separated when we speak of spinal strains being produced by visceroptosis. Our experience has been that the proportion of so-called strains and twists of the vertebral column are just as common in people of Type 1 as they are in Type 3. Of course, Type 3 does not produce as many physiologically sound individuals as Type 1. I do not attribute the unsound condition to the malposition of the organs, but to the general condition of the individual in which the visceroptotic condition is merely a part. Of course, in Type 3, as well as in Types 1 and 2, we meet individuals where there is marked stasis with consequent absorption of toxins, which in turn will produce changes in the vertebral column, such as deposits, and these, in turn, cause strains and twists, but this is not due to the visceroptosis, but to the pathological condition of stasis.

In an examination upon a series of normal individuals, where subjects were selected, all of them being athletes, all of them being thin but in perfectly normal condition, having absolutely no symptoms, but pronounced physically perfect as far as medical examination was concerned, and feeling physically perfect, yet each one of these presented a more or less marked degree of visceroptosis. The significant feature in these cases, however, was that we had a perfectly normal physiological action of the gastro-intestinal tract, and it seems to me that we must distinguish between these two types of so-called visceroptosis. In one we have what might be termed a normal visceroptosis. In the other type we have a pathological visceroptosis. Anatomically, the position of the gastro-intestinal tract may be the same, but physiologically one functions properly, and the other shows marked evidence of sluggishness, stasis and retention. It is only in this latter type of patients that there seems to have been a number of cases where there were so-called strains and twists of the vertebral column. If we eliminate these pathological visceroptoses our experience has been that the proportion of the spinal lesions which might directly be attributed to the gastro-intestinal tract was approximately the same in all three types. Consequently, our feeling is that the anatomical position of the gastro-intestinal tract plays very little part in the production of spinal lesions unless the gastro-intestinal tract functions pathologically, and then the lesions are not the direct, but the indirect, cause, that is, by absorption of toxins, with consequent deposits in and about the articulating surfaces of the vertebrae or in the calcification of the costal cartilages. We have observed, for example, in Type 3, in young individuals where there has been a marked stasis, that the costal cartilages have practically all ossified, consequently, there has been a certain limitation of motion in the play

of the ribs. These patients have invariably complained more or less of pains and aches which were directly referable to the spine.

We have also been much interested in seeing various congenital abnormalities of the spine, the most common of which is the congenital non-union of the laminae of the fifth lumbar vertebra. These patients almost invariably complain of more or less discomfort, which is invariably referred to the lower lumbar vertebrae or the sacro-iliac region. We find them as frequently in Type 1 as we do in Type 3. We have not been able to establish any connection at all between these abnormalities and the position of the abdominal organs.

In conclusion, we believe visceroptosis is incidental and plays practically no part in spinal lesions.

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### WHAT EVIDENCE CAN BE BROUGHT FORWARD TO SHOW THAT VISCEROPTOSIS IS ANYTHING MORE THAN A VARIATION FROM AN ANATOMIC NORM AND IS OF FREQUENT CAUSATIVE CLINICAL SIGNIFICANCE?

BY ROBERT B. OSGOOD, M.D., BOSTON.

IN order that this question may be the source of fruitful discussion it would seem necessary for us to agree upon some definition of visceroptosis. That it is a departure from an anatomic norm may be taken for granted from the prescribed title of this paper. Whether it is "anything more" or whether it is of frequent causative clinical significance is the important part of the question before us.

According to the definition proposed by one of the writers for this symposium on Visceroptosis, the position of any organ or organs which is lower than normal must be considered a ptosis, and therefore the condition would be a visceroptosis. If we consider that a visceroptosis exists when any organ is lower than normal, then the question raised by the subject might be answered almost at once. A prolapsed ovary, a retroverted uterus, a rectocele, a cystocele, a floating kidney, are all conditions in which the organ or organs are lower than normal, and it

will be generally admitted that many such conditions are of frequent causative clinical significance. If we were to accept this simple, and, it seems to us, somewhat inadequate definition, perhaps our discussion need go no further.

As we understand it, however, the purposes of this symposium would not be accomplished by such a definition and such a hasty disposal of the question. We must rather define visceroptosis in broader and more comprehensive terms, and attempt to describe a condition which is more or less of a clinical entity.

We shall, at any rate, in this paper attempt to discuss the frequent causative clinical significance of a visceroptosis which we would define as a departure from the normal position of the viscera throughout the abdomen, which is general and marked, and which is accompanied by changes in the posture, which may be said to be typical.

#### WHAT MAY BE CONSIDERED AN ANATOMIC NORM?

Since the thorax, and especially the diaphragm, will be found to enter into this question of visceroptosis, we must include the chest in our consideration of an anatomic norm. Taking anthropologists and anatomists and sculptors and artists as probably the best qualified persons to determine a norm, we find them agreeing that an erect posture and chests which have a generous expansion, a wide costal angle, and absence of a sulcus or other deformity, may be accepted as anatomic norms for the chest. In addition, as Bryant<sup>1</sup> suggests, in children there exists a definite normal relationship between the circumference at the angle of the eighth rib and at the lower border of the sternum. Dodd and Morrison<sup>2</sup> also have shown that the diaphragm excursion in the normal individual occupies a space in the fluoroscopic shadow which is half way between full inspiration and full expiration.

When we come to the abdomen we shall have more difficulty, perhaps, in agreeing upon our standard for an anatomic norm. Dexter<sup>3</sup> and other anatomists have shown that the development of the peritoneum and the mesenteries may vary widely at birth and still perhaps be considered within normal limits. The stomach may be more or less mobile, and high or low; the small intestine, as shown by observers, Bean, Dreike, Bryant, Swaim, et al., may vary greatly in length. Limiting membranes, *e.g.*, Jackson's membrane and adhesions, congenital or acquired, may be present to a greater or less extent, and the transverse colon may be more or less festooned; the sigmoid may take simple or complicated curves, may be short or redundant. Notwithstanding these

wide variations within normal limits, we may assume that the kidneys should normally not be hypermobile, that the stomach should normally be an abdominal and not a pelvic organ, that the caecum should be in the right iliac fossa, and that there should be hepatic and splenic flexures to the colon.

Moreover, the abdominal wall should be a more or less vertical and not a partly horizontal wall, and the natural supports, which Martin,<sup>4</sup> Goldthwait, and others have described, of the visceral fat pads should be present.

If we have, as our definition of visceroptosis states, a lowering of the position, or a sagging of the viscera throughout the abdomen, allowing for the possible variations to which we have just alluded, which sagging is general and marked, and if at the same time we have an habitual posture of the individual which is mechanically inefficient for erect carriage, and is associated with a lax, overstretched abdominal wall, then we may be said to have an abdominal departure from an anatomic norm. The enteroptotic individual now stands before us, presenting a picture which has been so long and so widely discussed that we need attempt no further description, but rather consider the two main types.

#### ACQUIRED FORM.

It does not require a series of "human documents" to convince us that with increased weight and increased years and lessened resistance and lessened exercise, men and women are prone to develop not only large, but sagging abdomens. It would seem unnecessary to discuss among orthopaedic surgeons the question as to whether these abnormalities are of frequent causative clinical significance. They have been gratefully thanked for too many belts and corsets. We can hardly doubt the *propter hoc* of the relief which artificial supports and exercises afford to the lame backs and tired limbs and to the constipation from which these persons frequently suffer. We do not consider that we are dismissing this phase of the question before us too hastily if we confine our discussion to the more subtle part of our question,—that of the so-called congenital type, which we may detect in the child and which is likely to persist through life. It is largely the question of the frequent causative clinical significance of this type which chiefly concerns us.

*What Evidence Then Is There to Show That This Most Common, We May Almost Say, Most Congenital Type of Visceroptosis, Is of Frequent Causative Clinical Significance?*

## HISTORICAL.

The historical evidence is largely negative, but is to us most suggestive. We believe it is fair to say that the soldiers of the conquering nations of the earth have not been, as far as one can judge from ancient sculpture and ancient art, of the visceroptotic type, nor have their actual leaders, who must have represented intellectual as well as physical superiority, shown either the congenital or the acquired forms. The Spartans are perhaps the most striking example of perfect carriage and body form.

## ANATOMIC.

When we turn to the anatomic evidence we must consider the anthropological studies of Treves and Bean, the autopsy records of Bryant, and the anatomic analyses of Goldthwait. All these observers insist upon the existence of at least three different types of the human family. The extremes of two of these types, and the third, or neutral, are recognized by all. There is obviously the fat man, woman, or child, of broad build, and the thin man, woman, or child, of slender build. There is also an intermediate normal type, and many individuals who on the one hand have characteristics which suggest their being grouped on the heavily-built side of the neutral, and other individuals who may be grouped on the lightly-built side of the neutral. Bean calls the heavy types, from his embryological and anthropological studies, the hypo-onto-morphs, the intermediate types the meso-onto-morphs, the slender types the hyper-onto-morphs. Now the hypo-onto-morphs represent the so-called herbivorous type of the other observers, while the hyper-onto-morphs represent the carnivorous type. It is among the latter class that the form of visceroptosis, which it seems advisable for us to study in relation to its frequent causative clinical significance, occurs. Congenital in its nature, associated in a large percentage of cases, as Bryant's autopsy records (300) prove, with the narrow chest, abnormal intestinal adhesions, and probably frequently with ileal stasis, it is a recognizable anatomical fact. We begin to accumulate the evidence we seek when we study the statistics of Bean<sup>5</sup> based on observations of 1002 patients and 317 autopsies. He finds that in this epitheliopath or hyper-onto-morph, or carnivorous, or congenital visceroptotic type, the stomach is small and low, J-shaped, and far to the left.

The liver is small and low, vertical and far to the right.

The small intestine is small and short, 15-20 feet or less.

The colon is long with a low hepatic flexure, a high splenic flexure, and the transverse portion a long, low loop, probably with a long mesentery.

Studying the clinical records, he finds these individuals strikingly susceptible to tuberculosis, insanity, pellagra, leprosy, and carcinoma, and gives his opinion that the position of the viscera may account in part for this susceptibility, and that these five diseases seem to be diseases due probably primarily to faulty nutrition.

This is the visceroptotic type.

Goldthwait's study of frozen sections demonstrates clearly that certain definite types of posture and relaxed abdominal walls must favor a sagging of the viscera. Whether we consider these changes to be the frequent cause of symptoms, or whether we do not, we can hardly doubt the anatomic facts, and they are impressive. It would surely seem that derangements of this sort must predispose in time to faulty action of viscera, since mechanical conditions are altered, and altered in ways which do not suggest more favorable action or improved function.

#### PHYSIOLOGICAL.

The physiological evidence is interesting and greatly strengthened by very recent literature.

Let us consider first certain aspects of Cannon's<sup>6</sup> study of the mechanical factors of digestion.

It seems to have been definitely established that absence of activity of the digestive processes may be due either to a failure of the nerve impulses which establish the necessary tonic state of the musculature or to the predominance of the impulses which depress this tonic state. The vagus nerves have great influence in establishing this tonus, the sympathetic system has great influence in depressing or inhibiting this tonus so necessary to normal action and assimilation.

The vagi may be said to set the tonic state of the stomach, and this tonic state is of prime importance for normal functioning of the gastric neuro-musculature. In all probability the vagi adapt the size of the organ to the varying amounts of food taken in. The vagus nerves convey mostly motor nerves to the small intestine,<sup>7</sup> and Meltzer<sup>8</sup> has observed that vagus stimulation caused strong contraction of the caecum in the rabbit.

The large intestine receives a motor supply through the sacral visceral nerves. The inhibitory impulses come from the splanchnic sympathetic for the stomach and small intestine, and to the large intestine



from the lumbar cord through the sympathetic system by way of the inferior mesenteric ganglion. Very roughly and briefly this would seem to be the nerve supply of the alimentary tract, which may have a bearing on the question before us.

Would the marked sagging and hypermobility of the organs, especially the stomach, of the visceroptotic individual be likely to have any effect on the nerve supply?

Conceivably, yes. We know that sudden stretching of motor nerves inhibits their action, for example, the sciatic nerve and other motor and sensory nerves after injuries. We know from X-ray studies, that the stomach during recumbency is in a much higher position in the visceroptotic than in the erect posture. During the night of recumbency perhaps the vagi have taken up slack. The erect posture is assumed, and a very distinct descent of the food-filled organ, often several inches, may represent, it seems to us, a very real inhibitory stretching. There is no question about the improvement in the gastric digestion which takes place in many visceroptotic patients when they regularly assume the recumbent and hyperextended position after meals.

A most interesting article has been written by Sherrington<sup>9</sup> on postural tonus. He finds that this much-discussed condition of constant slight contraction, which is reflex and not conscious action, is confined to those muscles which maintain the animal in an erect attitude. In the preparation of a cat from which the cerebrum has been removed, the reflex tonus is present in those muscles which have to do with the position of standing with the abdominal walls tight as well. This reflex tonus is modifiable even in this decerebrate preparation to a remarkable degree. If, for instance, the head is forcibly flexed the forequarters sink, *i.e.*, tonus in the extensors diminishes, while that in the hindquarters increases. This would be the position maintained if with the head flexed the cat were looking under a shelf. If now the head portion and the neck are tilted backwards and upwards, the opposite phenomenon occurs and the preparation assumes the position of a cat looking up at a shelf, so strongly maintained that it stands unsupported. With each main posture of the head even passively imposed as in the preparation above described, a corresponding reflex modification of the reflex tonus of the skeletal musculature takes place. As Magnus and de Klein<sup>10</sup> have demonstrated, posture, therefore, has a definite relation to tonus.

Active posture may be described physiologically "as those reactions in which the configuration of the body and of its parts is, in spite of forces tending to disturb them, preserved by the activity of contractile tissues, these tissues then functioning statically."

Considering these facts, it becomes pertinent to inquire why there is not greater disturbance in the function of the organs from the markedly faulty posture of the visceroptotic, especially since Langelaan<sup>11</sup> has concluded from most extensive and complete experiments that a continued pull exercised by a moderate weight suspended on the tendon of a muscle produces in that muscle a permanent deformation, as long as the weight remains.

The answer is found in the further established physiological fact that if a muscle be stretched out, either passively or actively, it lengthens, but retains the same degree of tonus, and this is true to some extent with the visceral as well as the skeletal muscle. Mosso and Palladini<sup>12</sup> found that varying amounts of fluid in the bladder did not necessarily alter the degree of pressure, *i.e.*, it could not be compared to an elastic bag, but the tonus of the muscle wall adjusted itself up to certain limits like the tension of a hand adjusting itself to varying sized objects which it might hold.

These facts seem to us to aid in understanding the more or less habitual posture of the visceroptotic person, the absence of acute symptoms in the majority of cases, and the clinical significance of the condition as regards physiological efficiency.

There is another factor in the physiology of digestion which is of extreme importance. Cannon has shown that when the nervous connections between the alimentary canal and the central nervous system are intact, nothing is more remarkable than the responsiveness of the canal to general asthenia. In animals with soft, toneless muscles, *e.g.*, from distemper, food will lie in the stomach and intestines all day, so great is the stasis. Moreover, in the cat, rage or distress or mere anxiety is accompanied by a cessation of the normal movements of the stomach. Now there can be no question of the association of visceroptosis with debility and asthenia. Which is the cart and which the horse may be hard to say, but the cart is often quite as important as the horse if burdens are to be carried, and vicious circles may be broken through in various places. Not rarely the asthenia diminishes when the ptosis is relieved. It would seem again that it might be of clinical significance and of causative significance.

#### ROENTGENOLOGICAL EVIDENCE.

This evidence, which on first thought might seem conclusive, remains on sober thought, still more suggestive. It is not as conclusive as it at first appears, since unless the bismuth or barium meal is a food as well

as a mineral meal, we may be misled by an apparent stasis and by an exaggerated ptosis which is due to gravity. In the abdominal cavity under normal conditions gravity can have little effect upon the relative position of the organs, since the semifluid walls of the organs and their semifluid contents are of about the same specific gravity.

The fact does remain, however, that the great majority of cases seeking Roentgenological investigation because of some digestive trouble, show varying degrees of ptosis and that the cases of true ileal stasis, associated with adhesions and a sharp or wanting splenic flexure, have shown marked degrees of ptosis.

In a study of cardiospasm being made by Mosher and Holmes, marked degree of ptosis has been found in all the cases in which it has been sought.

Goldthwait has had very marked cardiospasm disappear entirely by changes of posture calculated to relieve the ptosis.

As has been stated above, Dodd and Morrison have found that the excursion of the diaphragm is much less than normal in the visceroptotic individual. Associated as the type almost invariably is with a narrow costal angle and a narrow chest, the shallow breathing would seem to supply less perfect aeration. Its possible clinical significance is suggested by the fact that in life insurance figures the quality of the risk seems to be directly proportionate to the number of inches of chest expansion.

The Roentgenological evidence that visceroptosis is associated at least with debility is furnished also by Swaim's figures.<sup>13</sup> Of 340 sanatorium patients who had a Roentgenological examination following a shadow casting meal, 88% presented evidence of ptosis.

We must constantly check up our Roentgenological findings by clinical evidence. Interpretation is not easy, but the language is being learned.

#### CLINICAL.

*Medical Evidence.*—The medical evidence is found in the very general conviction among medical men,—a conviction born of clinical experience,—that visceroptosis and poor health are so frequently inseparable that they both must have a blood relationship which is so close as to have now one causal and now the other. It is our impression that the history which is obtainable from photographs, etc., would show that the ptoses almost invariably preceded by many years the onset of circulatory, nervous or digestive symptoms. In adults, ptoses will be found chiefly in sufferers from asthenia and other nervous or vasomotor conditions

accompanied by a low blood pressure. Stasis, of course, is frequent with its numerous subinfective or toxic consequences. Convictions and impressions are not always truths, even though they be medical convictions. There is, however, evidence as to the causal relationship of visceroptosis to certain specific diseases.

Lerch,<sup>14</sup> for example, makes the very sweeping statement that he has never examined a neurasthenic or hysterical person in whom enteroptosis was absent. Epilepsy seems also to occur most commonly in the same type, and there is an increasing amount of evidence accumulating which is leading to the belief that epilepsy is of intestinal origin,—Skoog,<sup>15</sup> Berger,<sup>16</sup> McCoy,<sup>17</sup> Axtell,<sup>18</sup> Cornwall,<sup>19</sup> Reed,<sup>20</sup> et al.

The most striking evidence may be built up concerning the causal relationship of tuberculosis and visceroptosis.

Hertz,<sup>21</sup> writing on the influence of body form and posture on heart action, has determined the close relationship between change in the shape and action of the heart in relation to posture and form. Pottenger<sup>22</sup> and Grödel<sup>23</sup> have found that small hearts are the rule in pulmonary tuberculosis, and in those having narrow chests and suffering from enteroptosis.

We quote from Bean<sup>24</sup>: "Practically every individual, white or colored, male or female, who is afflicted with tuberculosis is of one type, a type more distinct than any other human type, readily separable from the other types by difference in ear form, physiognomy, and in the length relations of body parts." This type, gentlemen, is the visceroptotic type.

*Surgical Evidence.*—When we begin to seek surgical evidence, we find it hard to pick and choose the most significant. No one familiar with surgical literature can for a moment doubt that surgeons and the medical men who refer the cases have believed that many of the symptoms for which their digestive patients sought relief were caused by the co-existing visceroptosis. Relief has by no means always followed the surgical procedure which aimed to cure the gastropotosis or splanchnoptosis, to anchor the kidney or straighten the uterine canal. The many failures may have shaken faith in the method of relief, not in the cause of the symptoms.

Two most interesting symposia on the subject have been held, one by the American Gynecological Society in 1910, and the other by the Surgical Section of the American Medical Association in 1912. The title of the former was "Neurasthenia Associated with Ptosis," a title in itself rather suggestive.

Dr. Joseph Blake's<sup>25</sup> conclusions in his paper were as follows: The patients suffering from visceral ptosis and neurasthenia may be divided into two classes. (1) Where the ptosis of the organ contributes to the neurasthenic state simply by the effect produced in the organ itself. In this category may be placed displacement of the kidney, uterus, and possibly the stomach. (2) In the second class a vicious circle is established and the ptosis is a direct factor in perpetuating and increasing the neurasthenic state, if not its underlying cause. This class comprises chiefly the cases of enteroptosis, either alone or associated with general splanchnoptosis, in which auto-intoxication is a marked feature.

Now statements like the above must be backed up by facts in order to be accepted. Dr. Blake thought that he had the facts.

Dr. Richard R. Smith<sup>26</sup> obtained 51 replies from women suffering from neurasthenia and visceroptosis. Every single one of these had had pelvic operations in the course of seeking relief.

Rovsing,<sup>27</sup> whose personal experience is very large, maintains that "all the 'morbid symptoms and conditions which we find typical in patients with enteroptosis allow themselves naturally and spontaneously to be explained as a result of the ptosis. The correctness of this conception has been confirmed by the observation of the 400 cases' which he has personally treated and the statistics of which he submits. These statistics are the more impressive since he reports the favorable results of other men who have performed his operations of gastropexy, etc.

Among other contributors to this symposium were Charles Mayo and Coffey. Surgical conviction seems to be as strong as medical conviction that visceroptosis is of frequent causative clinical significance, nor is this conviction confined to the enthusiastic disciples of Sir Arbuthnot Lane.

*Orthopaedic Evidence.*—We shall pay least attention to the orthopaedic evidence from an argumentative point of view. We all see these medical and surgical derelicts and many of us pass them on as derelicts still. It has been my good fortune to be closely associated with a man whose enthusiasm abhors derelicts, one of whose chief concerns is the repair of imperfectly used and abused human machines. Many, we may almost say most, of these machines which have come to him have been in other men's hands, and have had the stimulation of good medicine, of good surgery, and of suggestion. It has been to me surprising, for I have maintained a scepticism which I hope has been honest, to observe the return to health of these patients when their bodies have been remodelled, their postures corrected, and their ptoses thereby relieved.

Accompanying this orthopaedic treatment of visceroptosis and seemingly as a result, I have seen attacks of epilepsy cease, lateral sclerosis

and progressive muscular atrophy, diagnosed as such by careful and able neurologists, markedly improve over a period of years, certain cases of chronic arthritis grow steadily better, operations for supposedly gastric ulcer and appendicitis become unnecessary, sterility turn into pregnancy, cardiospasm disappear, habitual constipation give way and normal bowel action ensue. One cannot fail to be impressed. I cannot fail to be persuaded, that visceroptosis, from an orthopaedic point of view, is of frequent causative clinical significance.

#### CONCLUSIONS.

We are quite convinced, gentlemen, that a marked degree of visceroptosis may exist and the individual be entirely symptomless. That the incidence of visceroptosis is great is shown by the statistics of Sever<sup>28</sup> as regards children, and by the recent observation of Lewis<sup>29</sup> as to the existence of the types among the high school boys of Worcester. Sixty per cent. of these were of the so-called carnivorous class, and as a class they represented bad posture, poor muscles, poor nutrition, poor teeth, prominent abdomens and ptosis. They were not sick; but are we ready to say that their condition might not be of clinical significance? It would seem to be an evidence not of mortality but of morbidity.

The problem is a serious one because of its extent. These visceroptotic patients crowd our sanatoria. Swaim declared that he saw hardly more than 20 well-postured individuals among 3000 patients at Clifton Springs. The tuberculous children and adults almost without exception are of this body form.

Fischl and Popper<sup>30</sup> have shown that albuminuria may be caused by faulty posture. Silver<sup>31</sup> has discussed posture in relation to pain. Goldthwait<sup>32</sup> has interpreted the real significance of visceroptosis, and as orthopaedic surgeons we must appreciate these facts and meet the orthopaedic problem. Certain surgeons and medical men are realizing that the orthopaedic possibilities of relief should be sought first and not last, and, as Coffey says, when they do this they will do less surgery, but perhaps be conscious of better practice.

The task is like much other orthopaedic endeavor in that the way is long and the perfect result may never be attained. Indeed it is only very rarely that we may restore the anatomic norm. Relief of symptoms which cause distress is from the patient's point of view the end sought. This we believe in many instances may be accomplished.

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## DISCUSSION.

*Papers by Drs. Sullivan, Silver, Bettmann, Baetjer, and Osgood.*

DR. FREIBERG. I did not expect to open this discussion and had hoped to take quite an inferior part in it, and there have been so many problems advanced in these papers upon which I have very definite opinions that I hardly know where to begin. I am an enthusiast for the historical point of view of any subject, but in this case I feel that we have no definite data as to whether Alexander the Great or General U. S. Grant were visceroptotics or not. The histories of both have become more or less mythological, because mythology has begun to gather even around the Civil War. After experience in my own office with patients whose X-ray plates I have secured, I at first expected that persons with ideal posture would naturally show no enteroptosis, and that visceroptotics would naturally show bad posture, I have found this not to be the case, however, so that there is no argument to show whether Alexander the Great had visceroptosis or not. It seems to me that the relationship between certain toxic conditions and the lesions that concern us as clinicians is a very complicated one. We often find toxic conditions accompanying diseased tonsils; we remove the tonsils, but it is another thing entirely to say that when the condition clears up (if it does so) that it is necessarily due to removal of the tonsils. We cannot thus advance by intellectual short cuts. The question of disease has not alone to do with the pathological condition, and this should have particular significance for the orthopedic surgeon. He has to consider the differences between the anatomical peculiarities and deviations from the so-called normal, and their relationship to certain abnormal conditions as expressed by deviations from function and bodily comfort. I am very strongly in agreement with what Dr. Bettmann has said. An individual should normally have two eyes of the same color, but if he has not we are not warranted in the conclusion that he has abnormal function of the eye. The orthopedic surgeon has before him a constitutional condition which is of great importance to him. Take, for example, the condition of flat feet. It is not normal for feet to be flat, but should one, as a member of the American Orthopedic Association, treat an infant simply because its feet are flat? We recognized long ago that there are certain deviations from function and comfort synchronous with deviations in structure of the foot. Sometimes we can relieve conditions without paying attention to this deviation, but we know we must be careful before we draw conclusions. It seems to me extremely important to regard function as the important thing. It is of more or less importance whether an individual's bowels are up or down, but I do not think the evidence is always clear that we have successfully changed the position of the bowels. We do certain things to the individual which improve his condition, but that does not signify that we have changed the anatomical condition in the abdomen by improving the general posture. I do not think these two things necessarily follow. I have seen clinical evidence where the individual came with symptoms of abdominal abnormality and abnormal condition of posture. Treatment has made of this individual a hopeless nervous wreck whose chief job is to take care of himself. He has been made to lie down with the body



elevated, spend so many hours in practising this or that posture, and in the end has been very much worse even though his posture has been improved.

DR. GOLDTHWAIT. It is a matter of a good deal of interest to me to find a subject of this kind discussed at the American Orthopedic Association, because whether we want to take over the subject of visceroptosis or not, the subject is coming our way and we have got to ask ourselves how we are going to handle it. The terms used are tentative, but are the best we have. We all know that there are different anatomical types of human beings. You do not have to undress a man to see that his stomach is low. A low stomach is not necessarily a bad stomach. Everyone knows that a flat foot is good enough for ordinary purposes, but the U. S. Army will not take men with flat feet, because it knows that the flat foot has not the best structure to maintain efficiency under strain. There are different types of normal feet, the heavy broad foot with the low arch and the slender foot with the high arch. With the visceroptotic individual the efficiency is similar to the foot conditions as to efficiency. There is one thing upon which we must all agree, that the body used fully erect is better than the body drooped. Why does the army train men to hold themselves erect? It is because the body, or the human machine, will run with less friction if it is so trained.

The Shattuck Lecture was written because an anatomic basis for our work seemed reasonable. The two years given to anatomical study are simply that we may be prepared to treat patients from this standpoint. We orthopedists, however, rarely see the normal individual. We see individuals of two types, the slender individual who has one type of trouble, and the heavy individual who has quite a different lot of complaints. All the work of observers shows that each type carries its own characteristic symptoms. You can recognize this and reason it out. It is plain common sense. Whether the stomach differs in these types is of little consequence. There may be changes in the lateral or the posterior diameter of the body. In some types the ribs rest on the anterior part of the spine, and in these conditions it is hard to conceive that the stomach could work well. Some of these visceroptotics have trouble only when especially tired or overworked. There are all sorts of complex conditions arising which are not to be treated by medicine or controlled by surgery. My plea is to stop long enough to find out how the patient is made and how the parts should be placed in that condition. I have had two patients who have been unable to eat until placed in the prone position, then they can eat an ordinary meal. When the ribs fall forward they can take food without difficulty. These cases come to us and it is our duty to remodel the body so that the posture may be as nearly as possible normal. We must get the person into as good anatomical form as possible. You cannot put a low stomach high, but you can increase its tone so that it can handle food rightly. In cases of tuberculosis, posture is of importance. The normal excursion of the diaphragm in the heavy type should be considered; the slender type has no diaphragmatic movement when standing up. Posture often enters into the question of albuminuria, and you can change the sugar content in a short time. In these cases the work of the surgeon, the neurologist, the medical man, and the orthopedic man, is needed, the orthopedist having his part, and the others their part.

DR. DAVIS. In relation to the suspension of the internal organs, the liver and stomach, you have already heard of the ligaments which suspend them. Right above the liver is the diaphragm; the central tendon of the diaphragm is continuous with the pericardium and fascia which proceeds up the aorta and blood vessels and is continuous with the cervical fascia. This is attached to the transverse processes of the vertebrae of the neck and atlas, so that the liver and stomach, so to speak, hang from the neck.

DR. SULLIVAN. In regard to the last remark, I attempted to use some care in distinguishing between the attachment and the support. I think that these organs may be said to be attached to the diaphragm without receiving any perceptible support from this attachment.

DR. LEWALD. I have been very much interested in the discussion. The X-ray man has the opportunity to see a number of cases from several stand-points, the medical, the surgical, and the orthopedic. I would like to point out the way it appeals to me personally. The position of the person makes a great difference. One picture may show the stomach five inches above the crest of the ilium and another with the stomach below the crest. Surgeons very often see that. Very often there is no room in the upper abdomen for the stomach. Another point is the question of function. How is the stomach able to empty itself? If, at the end of six hours, there is a large residue of food, the stomach is not functioning properly. I know of one case of a young woman who had had the appendix removed, and she later developed nervous symptoms. As Dr. Osgood said, you must break the chain somewhere. This case had a gastroenterostomy done, and for three years has been perfectly well.

DR. BETTMANN. It does not seem desirable to go over the ground again. My plea was to treat each patient as an individual with individual problems to solve, and to avoid attaching too much importance to the departure from the anatomic norm, which is, after all, only a theoretical conception. We can never reach a clear understanding of the needs of a patient by the study of anatomy alone, and conclusions drawn from the anatomical conditions are apt to be very erroneous. The neurasthenic patients usually go from pillar to post, from the medical man to the neurologist and now to the surgeon. A correct estimate of their needs cannot be gained by any study based on the anatomical conditions present. These patients are often made worse if they have to spend a large part of each day and all of the night in particular posturing exercises. I insist that we must approach this subject from a standpoint of function without too many preconceptions. All we can expect to do in these symposiums is to present our different points of view, to point out to each other the greater or lesser inconsistencies of our theory and in this way we shall all arrive at the truth.

DR. OSGOOD. I hoped I had succeeded in confining the discussion to the asthenic type which has anatomically been recognized by everyone who has spoken this morning. It is obviously futile to consider at this date whether Alexander the Great or General U. S. Grant had enteroptosis or not, be-

cause we cannot come to any decision on the matter. Roentgen lived several thousand years after the one and several decades after the other. But what I meant to emphasize was that this type is a perfectly definite one. As to whether flat feet have any bearing on the subject or not, Dr. Freiberg's analogy is perfect. I belong to the class of benighted practitioners of this Association who would attempt to overcome, even by operation if necessary, feet which might be symptomless themselves, but which would prevent proper weight-bearing lines and very probably would cause strains in other joints. We must agree with Dr. Bettmann when he says that the physiological norm should be the important study. The point that we are making, however, is that the physiological attack of the internist has been often not successful. A large number of patients are still derelicts, and orthopedic surgeons are relieving these patients in large numbers.

DR. BAETJER. Most of the discussion has seemed to be on structural defects generally. My point is the question that visceroptosis is part of a general condition. If, for example, there are narrow ribs resting upon the ilium, they will push down the viscera. That is undoubtedly part of the general condition. I, personally, trace no relation between visceroptosis *per se* and constitutional defects. The viscera are simply a part of the whole. The roentgenologist has, perhaps, a less limited viewpoint. Probably most of the cases the orthopedist sees come to him as purely orthopedic cases, whereas the roentgenologist sees all kinds of cases and thus can check up from the general viewpoint.

I remember an article published by a neurologist on epilepsy and the sella turcica. It was stated that in 50% of the cases a certain condition of the sella turcica was present. There was found, however, to be exactly the same percentage of this same condition in normal brain. As regards the mention of men with flat feet being discarded in army examinations: We have a large negro population; most of them have flat feet, but how few of them show any symptoms. I have seen cases where visceroptotics have been put to bed with the head lower than the feet, and they have recovered. Later an X-ray examination has shown that there was no change in the position of the viscera. Another point: Dr. Lewald has commented upon the difference in the position in the upright and prone positions. That is true. We ought to understand the wide degree of variation. In the upright position everyone shows some degree of visceroptosis. However, a low stomach does not necessarily mean that the stomach functions badly. I have seen hundreds of patients of slender build with absolutely no symptoms. The upright stomach will empty in three hours, the cow-horn in four hours, and the stomach low down in the pelvis in five to six hours. Must we look upon some of these positions as pathological? If they are functioning properly, that is the great thing. We do not see these patients over a great number of years and we do not know what the end-result is, but for three or four years they seem to be normal. We shall, then, have to ask the question, "What is normal?" and we shall have to consider those cases as normal as far as function is concerned.

**A CASE OF FRACTURE OF THE ODONTOID PROCESS OF THE AXIS.****BY PRESCOTT LEBRETON, M.D., BUFFALO, N. Y.**

IN this case, the character of the injury, the absence of paralytic symptoms, the voluntary reduction by the patient of his own subluxation, and the gradual recovery, make it worthy of note.

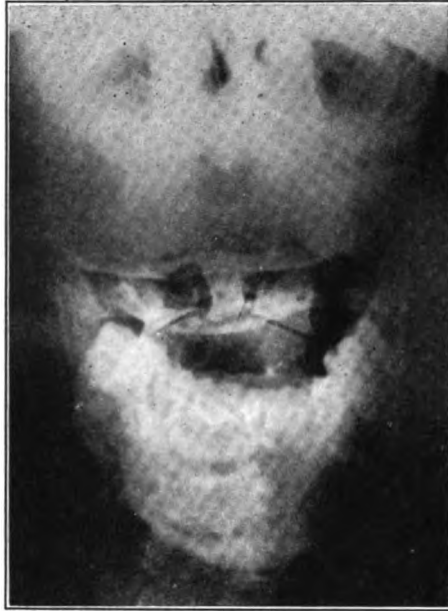


Side view of patient.

Male, aged 22, examined two and a half weeks after his injury. He was driving a wagon, while sitting on the end of a barrel. The barrel



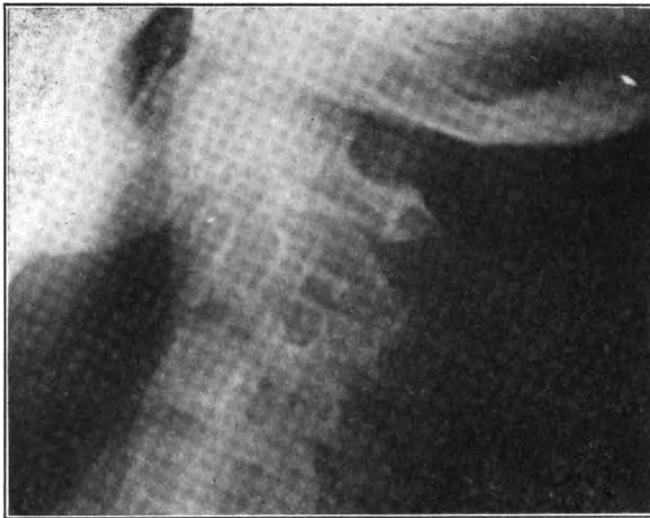
Front view of patient.



X-ray taken through the mouth, showing line of fracture in the odontoid process.

gave way, precipitating him forward. The horses, startled, ran to one side into a pole, and one horse, backing suddenly, sat with his haunches on the right side of the neck and head of the patient. After the horse got up, the patient crawled away, staggered to his feet, but fell again and lay still until he was carried home. He had great pain in his neck, with some swelling. His physician, on examination, found the head in a wry neck position and very stiff. On account of the absence of other signs, such as paralysis, he determined to wait, but after two weeks of no improvement, brought him to the General Hospital for examination.

The photographs show the position, chin up and to the left. The muscles were soft, but not spastic. The cervical spine showed a crescentic curve to the left. A bony projection to the left of the middle line, one and a quarter inches below the occiput, was evidently the spinous process of the axis, displaced. This was very tender to pressure. Above this there was a depression and below, down to the sixth cervical, there was another depression. The finger in the pharynx discovered no special irregularity. The patient could not move his head in any direction. He complained of constant pain. The pupils were regular, motion and sensation good. The pulse was slow, 40 to 60, and continued so during his stay. The opinion of a neurologist was that this represented an irritation of the pneumogastric. The patient did not know what his pulse had been before. The X-ray through the mouth showed a distinct



Lateral view, showing tilting of the atlas.

fracture at the base of the odontoid process. A lateral view showed the atlas was tipped forward, making the anterior line of the vertebral bodies irregular. An anterior-posterior view of the neck showed a bend at the junction of the third and fourth cervical, suggesting a subluxation at that point.

Traction to the head was tried for a time, with no benefit. The advice of consultants was that it was too dangerous to attempt reduction under an anesthetic. The patient, a quiet but sensible country lad, understood matters perfectly. One week after admission, during the evening when the ward was quiet, he placed his right hand at the back of his neck and his left on the top of his head, and wrenched his head straight with considerable force. He felt something give, and at once his steady pain ceased and he found he could move his head much more freely. The next morning he was found sitting up in bed, smiling broadly. He stated he was all right and wished to start home alone. A plaster collar was applied and he departed.

Six months later his physician stated in a letter that he was doing very well. Forward bending was almost normal; backward bending three-quarters of normal; side-bending and rotation about one-half. There was some thickening to be felt about the axis.

## PAUL REDARD AND EDMUND OWEN.

By the death of PAUL REDARD in Paris and EDMUND OWEN in London, the American Orthopedic Association has lost two of its corresponding members. They have both dignified the profession of Orthopedic Surgery and served it with distinction.

PAUL REDARD, Laureate of the French Institute, formerly of the surgical clinic of the Faculty of Medicine of Paris, and former physician-in-chief of the government railroads, was the head of a large and well-equipped clinic, the Furtoda-Heine Dispensary, which he founded. He was aided in starting this by the beneficence of a grateful patient, and it grew to be one of the largest orthopedic clinics in France. Americans were always made welcome and treated with every courtesy. Redard was genial and friendly and much beloved by his assistants and patients. He was constantly seeking the perfection of old methods, and yet ready to try new, and to accept with enthusiasm those of proved value. His contributions to medical literature were many and important. After 1890 they became wholly devoted to orthopedic subjects. An idea of the scope of his investigations may be gained from the following titles:

Études de thermométrie clinique abaissements de température-algidité. 1874.

De la section des nerfs ciliares et du nerf optique. 1879.

Deformités du pied en rapport avec l'absence congénitale des os de la jambe. 1890.

Sur une nouvelle méthode de traitement des luxations dites congénitales de la hanche. 1890.

Traité pratique de chirurgie orthopédique. 1892 and 1903.

Le torticolis et son traitement. 1898.

Traité pratique déviations de la colonne vertébrale. 1900.

Transport par chemins de fer des blessés et malades militaires. Rapports présentés en 1882 et en 1902 à l'administration des chemins de fer de l'état. 1902.

Précis de technique orthopédique. 1907.

Sur un cas rare de kyste muqueux à callules cylindriques du prépuce.

Chirurgie infantile et Orthopédique. *Atlas de Radiographie*. 1900.

(With Laran.)

EDMUND OWEN did his chief public orthopedic work at the Hospital for Sick Children in Great Ormond Street in London and was a well-known and representative English surgeon, with a strong orthopedic bent.

He was a Knight of Grace of the Order of St. John of Jerusalem and a Chevalier of the Legion of Honour. He was educated at Bishop's, Stortford, at Kings' College and at St. Mary's Hospital in London, completing his medical studies in Paris and received his M.B. in London. He was given an honorary D.Sc. from Sheffield and an LL.D. from Aberdeen, and was a Fellow of the Royal College of Surgeons of England and at one time its vice-president. He became consulting surgeon to St. Mary's Hospital, to the Hospital for Sick Children in Great Ormond Street and to the Masonic Girls' School. He was also surgeon to the French Hospital and Chief Surgeon to St. John's Ambulance Brigade.

He had many outside interests, being fond of travel, fishing and gardening, and was a member of the Royal Society of Musicians.

His chief publications were:

"A Plea for Early Operation in Appendicitis."

"A Manual of Anatomy for Senior Students."

"The Surgery of Cleft Palate and Hare Lip."

# Orthopedic Society Meetings

## AMERICAN ORTHOPEDIC ASSOCIATION.

### REPORT OF OPERATIONS. CLINICAL DAY, MAY 8, 1916.

1. DR. FRED H. ALBEE, New York. Bone Transplantation for Tuberculosis of Spine. (Two cases).

I think you can all get an idea what a tremendous kyphosis this is. There are a large number of overlapping slivers of bone, so that they interlock like the fingers. Both cases are presented to demonstrate similar technique which we apply in the straight back cases. We have been trying in our records to see exactly how quickly we can do them. One case has been done in a record time of 9 minutes, that was a case of perfectly straight back in a child. We keep them flat on their backs so that we can hold the graft for five weeks in the adult and for six to ten weeks in the child. Then we allow them up, with rest boards, for six months or a year afterwards. We do not put any casts on these cases. If it is difficult to control a case with a brace, we keep him on his side with pressure on the kyphosis. The first case shown should have apparatus for six weeks, then he will have six months' rest. The spinous processes are heavy here, and I believe there will be no necessity for a jacket.

2. DR. JAMES WARREN SEVER, Boston. Operation for obstetrical paralysis.

This is a case of obstetrical paralysis in the left upper arm. The fifth and sixth nerves have been injured at birth with a partial recovery of function. The child can now elevate the arm almost to the shoulder and there is no paralysis of the lower arm. There is distinct contraction of the pectoralis major and the subscapular muscles. The arm is held in the so-called "policeman's tip" position. I am going to cut the pectoralis major, the arm being abducted. I shall cut the subscapular tendon at the shoulder joint.

The difference between this operation and that done by Lange—the osteotomy of the shaft of the humerus—is that this allows more freedom of motion at the shoulder joint and allows as well complete regeneration. The Lange operation is more of a cosmetic operation than one which attacks the real problem.

The operation of Fairbank of London, is as follows: He locates the long head of the biceps tendon and follows it up to the shoulder joint. The capsule is then opened, which releases the insertion of the subscapular tendon and so allows better outward rotation of the arm. I have done that operation in two cases, but did not get good results because of the formation of adhesions between the capsule and the articular surface of the head of the humerus.

On the recent subscapular cases I start massage and manipulation after two weeks to gain increased elevation and abduction. This has proven well worth while. The operation is not a serious one if the proper after-course is carried out. The incision is straight down the arm from the acromio-clavicular junction, going between the deltoid and pectoralis major. The arm is rotated out and abducted. After the pectoralis major insertion is divided you can run the sound under the subscapular tendon. You can see that there is slight superior subluxation of the arm in this case and slight hooking down of the acromium. That occurs in practically all the obstetrical paralysis cases. In the older cases it is serious, and has to be corrected in all cases. The cephalic vein is here in the



wound, but it does not matter if you cut it, or it can be clamped. It can be cut and pushed to one side if necessary, but it is better not to cut it. After clearing the lower edge of the pectoralis major I shall cut it. There is no structure to injure here unless you are very careless, because you are a reasonably long way from the lower portion of the plexus. The sound is now under the insertion of the pectoralis major. As a general rule, once that is cut, the abduction is very free and easily accomplished, but the outward rotation is not free. You must put something under the pectoralis and cut it carefully. It is not enough to do a repair of the brachial plexus. Seven out of eight of the upper arm paralyses will get well, but cutting the contraction will improve them tremendously. Where the lower cords of the plexus are injured anatomic repair is impossible on account of damage to the plexus.

After removing the pieces of tight fascia, that brings you down to the short head of the biceps which can be seen here. Now the arm is ready to be abducted. You must retract the upper end of the wound to get at the subscapular insertion. You can see the improved abduction of the arm. Here you have to use a certain amount of care not to cut the pectoralis minor, which is easily done by mistake. Here is seen the coracoid process showing the biceps. On account of the posterior subluxation, it is hard to see. You can see the capsule of the shoulder and the head of the humerus rotating. There is a very tight coraco-acromial ligament here, but you can see the fibres of the subscapular tendon running into the capsule. The coraco-acromial ligament is extremely tight and I am going to divide it to get better exposure of the joint. You can see the subscapular fibres going in a horizontal direction. I have found the easiest thing to get in here is a sound. It makes it very simple. You must keep out of the shoulder joint because later adhesions might give you trouble. You see now that there is no limitation of rotation. You can sew that wound up and apply a plaster cast and then begin exercise at the end of two weeks. The child will have supination and elevation above the shoulder. In some very bad cases you can do a partial division of the short head of the biceps and sometimes osteotomy of the coracoid process. There is nothing to tie in this operation.

### 3. DR. ROYAL WHITMAN, New York City. Astragalectomy and Backward Displacement of Foot.

Paralytic calcaneus implies the loss of a muscle whose bulk is larger than that of all the other leg muscles combined, a fact which must be borne in mind when estimating the comparative efficiency of operations designed for the permanent relief of the disability. The deformity is characterized by a hypertrophic heel, corresponding atrophy of the forefoot, and an exaggerated cavus, a deformity that usually increases in spite of palliative treatment.

The astragalus forms the apex of the cavus, and it is the centre of instability. Its removal, together with backward displacement of the foot, restores relative symmetry, both as to cavus, lateral distortion, and the prominence of the heel, without violence. The adverse leverage of the foot is thereby reduced, while the contact of the scaphoid and tibia, by checking dorsal flexion, restores the resistance of the forefoot, and thus the propelling power of the limb.

The transplantation of the peroneal muscles to the tendo Achillis assures also a measure of voluntary control of the heel.

The operation, when properly performed, relieves the patient from braces. It assures security without ankylosis. It permits the attitude of plantar flexion, and thus the adjustment of an inoffensive shoe. With the restoration of function, the atrophy of the foot is checked; the nutrition of the limb is improved and growth is stimulated.

Thus although the operation has practically no alternative in cases of advanced deformity, it is also indicated at a relatively early age as a conservative measure.

In recent years the field of the operation has been extended to other forms of paralytic deformity than that for which it was primarily designed, in particular, those of a severe and disabling type, for which the minor operations of tendon transplantation and the like are ineffective. The removal of the astragalus and the implantation of the malleoli on the basic structure of the foot near the centre, equalizes its balance, and changes a complex to a simple joint. It checks dorsal flexion and limits the toe drop, thus assuring stability.

In cases of so-called dangle foot it often enables the patient to dispense with apparatus.

It is serviceable in cases of widespread paralysis to simplify the adjustment of braces.

It is particularly satisfactory in cases of hollow foot combined with valgus.

As a basic procedure it is supplemented by tendon transplantations or implantations according to the indications.

Since the operation is a mechanical adaptation to the anatomy of the disabled member, it is, if properly performed, thoroughly dependable, a quality that will appeal most forcibly to those who have the opportunity to compare so-called final results of the different operations that are undertaken for the relief of paralytic deformities.

Dr. Whitman operated on a girl 12 years of age for typical calcaneo-valgus. Although the paralysis was of but five years' duration, the shortening, chiefly below the knee, was two inches, explained, he thought, by the loss of function.

He operated under the Esmarch bandage. After the astragalus had been removed, the new articulation prepared, and the peroneal tendons transplanted to the tendo Achillis and reunited to their distal ends, the foot was displaced backward and held in an attitude of equino-valgus. The leg was flexed to a right angle with the thigh, and the entire limb fixed in a plaster support. It was then to be suspended from tapes extending from the head to the foot of the bed, in order to lessen congestion and to assure complete rest.

The first support would be removed at the end of three weeks, and a plaster splint applied for ambulation, extending only to the knee, the foot being supported by means of a cork wedge beneath the sole, in an attitude of moderate plantar flexion and eversion.

This would be retained for from three to five months until the new articulation had become secure, and until the new manner of locomotion and weight bearing had become habitual. A shoe would then be applied with a cork wedge under the heel, the outer border of the sole being slightly thickened to assure the attitude of plantar flexion and abduction in weight bearing.

In answer to questions, Dr. Whitman said that the keynote of the operation was the backward displacement of the foot, and particularly the fixation of the external malleolus over the calcaneo cuboid articulation. If this were unsuc-

cessful the foot would eventually incline toward varus, an inclination favored by the transplantation of the peroneal tendons. For this reason the foot at the time of operation was fixed in equino valgus, the position being modified somewhat when the walking splint was applied.

4. DR. ROBERT B. SOUTTER, Boston. Exhibition of a Reduction of Congenital Dislocation of the Hip, by Means of Dr. Bradford's Traction Machine.

The patient was 11 years old, the trochanter being almost to the crest of the ilium. The hip was successfully reduced and the plaster was applied with the thigh at right angles and the femur in neutral position as to rotation.

5. ROBERT B. SOUTTER, Boston. Soutter Operation for Flexed Hip.

Transplantation of the thigh flexor attachments to the pelvis. This operation is used for contractures of the hip in infantile paralysis or any other condition in which the ligaments and muscles are short anteriorly. The old method of making an anterior incision and cutting the muscles across is a pretty one to do, but requires a good deal of skill. This operation loosens the muscles from their attachment from the anterior superior spine and inferior spine subperiosteally. These attachments are then pushed downward, the muscles in no way being injured. There are no muscles to contract. There can be no injury to the structures.

The operation is done as follows:

A longitudinal incision is made at right angles to a line from the anterior superior spine to the trochanter. The incision extends one and one-half inches above this line and one and one-half inches below and one and one half inches posterior to the anterior superior spine. This incision extends through the skin and fat to the fascia. The skin and fat are retracted and a second incision is made from the anterior superior spine to the trochanter through the tensor fascia femoris. The skin and fat are then retracted exposing the anterior superior spine. An osteotome is used to clear the crest of the ilium on the inner side backward for one and one-half inches, on the outer side, backward for one and one-half inches and then downward in front, removing the tip of the anterior superior spine, the periosteum below it and the anterior inferior spine. The tissues thus relieved from their attachment are pushed downward with a sponge allowing the hip to hyperextend.

The patient operated on was one of right angle flexion of both hips; an extreme case of flexion contracture at the hip. When in a standing position the sacrum was almost horizontal before operation. This operation is also applicable to arthritic cases where there is right angle flexion of the hip. Before manipulating or operating on the hip, the anterior muscles are relieved from their contracture by this operation and pushed downward, allowing a joint operation to be done without danger of fracture from the bow string action of the anterior muscles.

*Question:* Do you take off the anterior superior spine?

DR. SOUTTER: I do take off the tip of the anterior superior spine with the periosteum. After the operation I have found that I can push the muscles downward at least one and one-half inches, in this case.

The patient after operation is put up in plaster from the nipple line to the tip of the toe. The plaster is cut away behind, above the pelvis and over the abdomen.

The plaster is put on with the hips and shoulder in one plane and the hip hyperextended below it. In order to maintain this position, the patient is put on a Bradford frame which supports the hips and shoulders and allows the thigh and leg to hyperextend below the frame. The frame is raised on boxes for this purpose.

6. DR. W. E. GALLIE, Toronto, Canada. Tendon fixation.

The idea of the operation which I propose to do on this patient is the conversion of the tendons of the paralyzed muscles into check ligaments. These ligaments must be of such a length, after healing takes place, that it is impossible for the foot to assume the position of deformity produced by the paralysis. The operation therefore consists of the correction of the deformity, either by forcible manipulation or by whatever operative procedures may be necessary, and when this is accomplished, the implantation of the tendons of the paralyzed muscles in the tibia or fibula in such a position that return of the foot to the former position is impossible.

In performing such operations the question arises as to whether tendons implanted in bone in this manner will unite solidly to the bone, and whether they will hold the foot in the corrected position sufficiently long to make the operation worth while. Four years have passed since the first operations were performed, and in the great majority of cases the correct position is still maintained. Some cases do show a tendency to recurrence, but it is felt that this is due to errors in technique. Such errors are the consequence of not completely denuding the tendon of its sheath before implantation, and failure to thoroughly bury the tendon in the bone for a sufficient distance. Before implantation the tendon is now carefully scarified. It was formerly the custom merely to bury the tendon in a groove in the bone, covering it only with periosteum. Since it has been ascertained, however, that no new bone grows over tendons thus implanted, we have been laying strips of the bone, removed in the formation of the groove, on the surface of the tendon, before closing the periosteum over it. In this way greater strength will be provided to the fixation.

In this particular case the tibialis posticus is completely paralyzed and the calf muscle partially paralyzed, resulting in calcaneo-valgus. It is proposed, therefore, to do a fixation of the tendon of the tibialis posticus and a fixation of part of the tendo Achillis. By using only a part of the latter, the residual muscular power of the calf will be retained, while the deformity is prevented by the fixation. To do this the tendo Achillis is split into two halves, an anterior and a posterior, and the anterior severed from its connection with the muscle. The posterior surface of the tibia is then exposed by an incision through the intermuscular septum between the deep and superficial muscles of the leg, and by retraction inward of the muscular bellies of the flexor digitorum longus, and the tibialis posticus. The groove is then prepared in the back of the tibia and the anterior half of the tendo Achillis buried in it, keeping it sufficiently taut to hold the foot in slight equinus. The sheath is then sutured with fine catgut over the remainder of the tendon.

In all these operations it is wise to use every assistance possible to prevent recurrence of deformity. Thus it is necessary, in the first place, to completely correct the deformity. Then, wherever possible, arthrodesis and tendon transplantation should be employed. By these means the implanted tendon will be relieved of part of the strain, of a constant tendency to deformity.

## Correspondence

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*To the Editor of the AMERICAN JOURNAL OF ORTHOPEDIC SURGERY:*

Your editorial comment on Dr. Sever's instructive paper in the August number of the JOURNAL induces me to call attention to the fact that the treatment from an orthopedic standpoint has not been entirely neglected in the past.

In 1904 I read a paper before the Neurological Section of the New York Academy of Medicine in which attention was called to the futility of operations on the brachial plexus without previous correction of the contractions and distortions that are usually present in neglected cases. Particular stress was laid upon the importance of subluxation at the shoulder joint as a cause of disability, quite apart from the paralysis, that in characteristic cases the head of the humerus projected posteriorly, evidently articulating with the posterior margin of the glenoid rim, while the front of the joint was correspondingly flattened. There was, as a result, practical fixation of the arm in an attitude of abduction, inward rotation, and anterior flexion in the relation to the scapula, the inward rotation being the most disabling distortion because it prevented effective supination of the forearm and use of the hand.

The treatment advocated was to reduce the displacement, to overcome the resistance of the contracted tissues, to enlarge the capacity of the disused joint, and to fix the arm in the overcorrected attitude until the secondary articulation had been obliterated, very much on the principle of the treatment of congenital dislocation of the hip. This was accomplished by methodical manipulation under anesthesia, by the aid of the leverage of the arm, the first step being to force the head of the humerus forward, and to stretch the contracted capsule, the second to rotate the arm outward, and the third to reduce the abduction by forcing the head upward and forward.

In resistant cases the correction was divided into several sittings, the arm being fixed in the intermediate attitudes to permit of accommodative relaxation of the resistant tissues. After final reduction, and after a period of fixation in overcorrection to assure stability, the treatment was concluded by the usual after-course of massage, stretching, and reconstructive exercises. Cases were presented showing almost complete functional recovery after the treatment, and others in which function had been greatly improved, in spite of persistent paralysis.

Manipulative correction of contractions and displacements has certain practical advantages over cutting operations. For example, the consent of the parents is readily obtained; the operation can be performed in the outdoor clinic, consequently it is available in a very much larger number of cases, and at a more favorable age. Furthermore, a contracted muscle is but one of the resistant tissues, and its division is required only when it is impossible to overcome its resistance by manipulation. While primary open operation might be preferred in the treatment of ward patients, it is usually possible to accomplish the desired result by the manipulations of so-called "bloodless surgery." Open operation is, therefore, a distinctly supplemental part in a comprehensive scheme of treatment, although the division of contracted muscles would doubtless hasten the restoration of function in those cases in which the changes in the joint had been as slight as in some of the cases reported by Dr. Sever.

The paper to which attention has been called was published in the *Journal of Mental and Nervous Diseases*, in 1904, under the title of "Remarks on the Surgical Treatment of Obstetrical Paralysis." The treatment was again described in a paper read before the New York Surgical Society in 1905, and published in the *Annals of Surgery*, with illustrations, under the title of "The Treatment of Acquired and Congenital Luxation at the Shoulder Joint." Vol. 42, 1905, also in the third and fourth editions of my "Treatise on Orthopedic Surgery," and the treatment, both operative and preventive, has been for many years a commonplace procedure in the clinics with which I am connected.

The importance of the injury, especially from the standpoint of prevention, also the slight representative value of published statistics, is indicated by the fact that during the past year 69 new cases were registered at the Hospital for the Ruptured and Crippled; 39 of these were in the first year of life, and 27 less than two months of age.

If cases of this class were under control, deformity might be prevented, and operative treatment on the brachial plexus might be undertaken as soon as no further progress toward recovery was apparent.

ROYAL WHITMAN.

283 Lexington Avenue, New York, August 9th, 1916.

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## Book Reviews

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*Handbook of Massage for Beginners.* By L. L. DESPARD. London: Henry Frowde, and Hodder and Stoughton. 1915.

Since its first publication in 1885, Dr. Graham's book on massage has been the leading American work on this important subject. Despard's much smaller volume, in the series of Oxford Medical Publications, owes its origin chiefly to the extensive necessity for amateur massage in the British military hospitals during the present European War. This admirable handbook is based largely on the author's larger textbook, but deals with the subject much more succinctly and simply. The book is divided into chapters dealing successively with the influence of massage, the classification and description of massage movements, the description of passive and active movements and of general massage and the methods of employing massage for sprains, dislocations, recent fractures, stiff joints, paralysis, deformities, diseases of the circulatory system; abdominal, constitutional and functional nervous diseases; fibrositis, lumbago, rheumatism, ischaemic contracture, bullet and shrapnel wounds, traumatic neurasthenia and frost bite, lubricants, fomentations, bandages and the applications of medical electricity. The book is well illustrated with eighty-eight figures in the text, and closes with a useful glossary of unfamiliar terms. This English handbook is a valuable contribution to the didactic literature of massage.

*Manual of Operative Surgery.* By JOHN BAIRBAIRN BINNIE, A.M., C.M. (Aberdeen), F.A.C.S. Seventh edition, revised and enlarged, with 1597 illustrations. Philadelphia: P. Blakiston's Son & Co.

A volume of 1400 pages with 1600 illustrations. Binnie's first edition was copyrighted in 1904, and the others have followed every year or two since. Binnie's effort has been, as he says, to "give aid to the surgeon when he is in trouble, hence much greater space has been devoted to some rather rare operations than to many of far greater everyday importance but which ought to be familiar to everyone."

Sutton adds 30 pages of War Surgery. In Sutton's chapter there is an excellent summary of the treatment of infected wounds. It is, in fact, one of the best which the reviewer has seen; it has been condensed into half a dozen pages.

Binnie's book continues to be an admirable treatise on operative surgery. It is useful both as a textbook and as a reference book. Its very numerous pictures are adequate, and its text is clear; its consideration of operative indications is sane and admirable.

*Orthopedic Surgery for Nurses.* By JOHN MCWILLIAMS BERRY, M.D., Clinical Professor of Orthopedics and Rontgenology at the Albany Medical College, New York. Philadelphia and London: W. B. Saunders Company. 1916.

A sketchy little volume on Orthopedic Surgery written for the trained nurse in the belief that a trained nurse should possess a thorough knowledge of the principles and practice of all types of nursing, and that she should understand something of orthopedic surgery. It is not so much to supply nurses with a text-book as to give them a book which will discuss clearly and simply the diagnosis, prognosis, and treatment of the more common and important orthopedic deformities. It is worthy of being recommended to nurses with this end in view.

*The Intestinal Putrefactions.* Clinical Studies of Enterocolitis. By CHARLES FENNER PECKHAM, M.D. Snow & Farnham Co. 1916.

It is with a good deal of uncertainty that the reviewer attempts to give an impression of this book. Dr. Peckham is a special pleader. For example, he can trace arteriosclerosis, cirrhosis of the liver to intestinal putrefaction. But on the whole his claims for the evil results of intestinal putrefaction are modest compared to certain other enthusiasts. In Dr. Peckham's mind, enterocolitis is such a common but pleomorphic disease entity that it seems impossible to give a clear-cut picture. Consequently one's impression concerning the clinical aspects are exceedingly vague. There is a good deal of indefiniteness concerning the therapy. Intestinal antisepsis is spoken of as if it were a well recognized fact.

A considerable portion of the book, which is less than 100 pages, is taken up with an exposition of the laboratory methods of examination of the stools and urine which are designed to show the presence of intestinal putrefaction.

# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus Etc.
- X. War Surgery.

## I. TUBERCULOSIS OF BONES, JOINTS, AND TENDONS.

BISMUTH PASTE IN CHRONIC SUPPURATIVE SINUSES AND EMPYEMA. Emil G. Beck. *Jour. Amer. Med. Assn.*, July 1, 1916, p. 21.

In 527 cases with sinus treated with bismuth paste, which have been reported in the literature by various surgeons, an average of 80% were successful, but the success in the different groups varied from 12.5% to 100%. Beck thinks that this discrepancy is largely due to faulty technic, and feels justified in again giving instructions for the use of the paste. He emphasizes the necessity of having the paste liquid and uniform, of filling every crevice of the sinus by maintaining pressure over other openings, at the same time cautioning against undue force, which may produce fresh wounds. Stereoroentgenograms, both before and after the injections, are recommended, as well as a bacteriological examination. When discharge becomes immediately thin and serous, the injection does not need repetition, but if pus persists, it should be repeated every five or six days, and if this does not suffice, cause for the suppuration will usually be found in a sequestrum, or the location of the focus will be found in a region inaccessible to the paste. Bismuth poisoning exceptionally occurs when paste is retained in large pockets, in which case it should be washed out with warm olive oil. Beck also reports cases of rectal, pararectal, vesical and fecal fistulas treated with bismuth, in which not only was the treatment largely successful, but the injection proved the source of pus to be in the hip joint or spine, so demonstrating the diagnostic as well as therapeutic value of the paste.—*Eben W. Fiske, Boston.*

DIAGNOSIS AND TREATMENT OF TUBERCULOSIS OF THIRD CERVICAL VERTEBRA. J. Ridlon. *Illinois Med. Jour.*, June, 1916.

As a possible compensation for many hours of otherwise unremunerated labor in examining 150 papers of candidates for Cook County Hospital internships in the spring examination held by the Cook County Civil Service Commission, Ridlon indulges in some critical comments on his highly interesting experience, reflecting more or less severely upon orthopedics as it is learned, if not as it is taught, in the better medical schools of Chicago. The question which Ridlon, in collaboration with Lewin and Lynam, was called upon to examine is given in the title of this abstract. He says, "The points upon which the examination papers universally agreed were: The patients are practically always children of tuberculous parents; are as a class evidently unhealthy; practically all have been subjected to injury of the neck;



practically all have had abscesses; all the abscesses should be opened; and every case must sooner or later be subjected to an Albee's or a Hibbs' operation"; and then proceeds rough shod to show wherein the anxious applicant is suffering from a tenuity of necessary diagnostic measures and a plethora of useless and even harmful collateral tests and operative procedures.

One is left to draw his own conclusions, but in finishing, Ridlon says: "Considering all this misinformation, I felt that there was some excuse for what Frank Lydston said to me some 20 years ago—'A medical student ought to be taught only enough to know to whom he should send his patients.'"—*Charles A. Parker, Chicago.*

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

RESECTION OF POSTERIOR ROOTS OF SPINAL CORD FOR CURE OF SPASTIC PARAPLEGIAS. E. M. Bland. *Ohio State Med. Jour.*, March, 1916.

Bland reports 11 cases of spastic paraplegia treated by resection of posterior nerve roots according to the teachings of Foerster, with marked relief except in one case, the first, which died shortly after the operation.

He believes this fatality might have been prevented had he practiced his present method, suggested to him by Berger of Cleveland, of injecting novocain into the substance of the cord above the seat of radicotomy to prevent the shock to the brain.

He details three cases as types in which his results were very encouraging. All proven advance in the treatment of this serious condition is decidedly welcome, and resection of nerve roots is apparently worth trying in suitable cases, but it is doomed to failure in many cases with deficient mentality and needs to be supplemented, as the writer states, with tenotomies, fasciotomies and other corrective measures in order to obtain the approach to relief. Many have been very efficiently treated by these orthopedic means, properly carried out, without resection of the posterior roots, in spite of the author's assertion regarding these measures that "up to very recently these efforts have proven uniformly unsuccessful."—*Charles A. Parker, Chicago.*

A CASE OF MARKED POST-DIPHTHERITIC PARALYSIS. W. A. Daley and C. V. McCormack. *The Lancet*, April 29, 1916.

Patient, 2½ years old, admitted with diphtheria Nov. 1, 1915. On Nov. 22 developed paralysis of palate. Dec. 10 showed paralysis of intercostals; by Dec. 24 complete flaccid paralysis of legs had developed. They were massaged regularly. Jan. 1, 1916, complete external ophthalmoplegia. By the end of January all paralysis had cleared up except some inversion of the foot, and this disappeared by Feb. 16, 1916.

This is rather an extensive case of paralysis to make so complete a cure.—*F. G. Hodgson, Atlanta.*

ORTHOPEDIC TREATMENT IN HEMIPLEGICS OF LONG STANDING. George R. Elliott and Samuel W. Boorstein. *Jour. Amer. Med. Assn.*, July 1, 1916, p. 31.

Hemiplegics are usually classed as chronic invalids if motor function is not restored in a few weeks, or if contractures set in, this being the teaching of most neurologists. Having restored to active function a patient who was practically bedridden for twenty-one years owing to marked contractures of leg and arm, the authors feel justified in urging that there is no time limit

for improvement in hemiplegics, for whom orthopedic treatment by means of braces, massage, and exercises should be employed at all stages.—*Eben W. Fiske, Boston.*

**LAMINECTOMY WITH SIMPLE EXPOSURE OF THE SPINAL CORD.** Charles A. Elsberg and Pearce Bailey. *Jour. Amer. Med. Assn.*, June 10, 1916, p. 1852.

The striking improvement which has followed laminectomy in thirteen cases without cord pressure has led the authors to conclude that the operation is decidedly beneficial and attended by little risk, except in the region of the conus and cauda equina. Normal reflexes may be temporarily decreased or abolished, but the effect on pathologic conditions of the spinal cord may be profound, and result in modifying or checking the disease to such an extent that "return to normal conditions is even possible."—*Eben W. Fiske, Boston.*

**PARALYSIS DURING PASTEUR ANTIRABIC TREATMENT, WITH REPORTS OF SEVEN PERSONAL CASES, ONE TERMINATING FATALLY, AND SIX OTHER PREVIOUSLY UNREPORTED CASES.** Frank S. Fielder. *Jour. Amer. Med. Assn.*, June 3, 1916, p. 1769.

A very small number of the Pasteur antirabic cases develop a paralysis and occasional death. Adults are usually affected.

The cases in need of treatment should be given this treatment in spite of the slight risk, but to those persons who insist on treatment in the absence of clinical or laboratory evidence that the biting animal was rabid, the risk should be explained.—*Edward S. Hatch, New Orleans.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

**DISINFECTION OF SEPTIC JOINTS.** F. J. Cotton. *Boston Med. and Surg. Jour.*, June 1, 1916, pp. 779-780.

A report of seven cases of elbow and knee infections to support the writer's idea that joint disinfection is possible and harmless. Extended previous experiences made him believe that *closed* joints have high resistance to septic infections, instead of a low one, as is often thought; and that joint tissues withstand very well, indeed, usual active disinfectants. He believes that joints must be sealed up after operation to protect them from re-infections from surrounding muscular and intermuscular spaces, and agrees with Murphy that drainage of such joints is a crime. As a matter of practical experience, he has found that drainage does not work, while disinfection and closure is often successful. The choice of the disinfectant and its strength is not discussed; but from case reports we learn that fifteen minutes' irrigation with 1-15,000 bichloride in salt solution, followed by flushing with simple salt solution, was very successful in a joint filled with thick staphylococcus aureus pus. The evidence presented confirms the writer's judgments, and is given in his usual concise, convincing style.—*H. W. Marshall, Boston.*

**THE TREATMENT OF ARTHRITIS BY THE INTRAVENOUS INJECTION OF FOREIGN PROTEIN.** Joseph L. Miller and Frank B. Lusk. *Jour. Amer. Med. Assn.*, June 3, 1916, p. 1756.

Following the successful results from the intravenous employment of typhoid vaccine, vaccine from bacillus coli, and even albumose and proteose in typhoid fever, demonstrating that the reaction is not due to a specific vaccine, but to the action of a foreign protein, the authors tried both proteose and typhoid vaccine in cases of acute, subacute and chronic arthritis, which were proved to be of a persistent type. Following injection, the pa-

tient reacted by a chill, rise in temperature and leucocytosis, the latter depending on the acuteness of the infection, with gradual improvement in the joint symptoms. Chill and febrile reaction grew progressively less with daily repetition, and definite relief followed after three or four days in all cases, no relapse having occurred in several of each type after four weeks. Gonorrheal arthritis was particularly benefited. The authors feel that the results have demonstrated the value of a foreign protein, as well as furnishing evidence of the non-specificity of vaccines, except for preventive purposes.—*Eben W. Fiske, Boston.*

**CASE OF JUVENILE DEFORMING OSTEOCHONDRITIS OF HIP.** J. L. Stevens. *Ohio State Med. Jour.*, February, 1916.

Stevens presents a brief history and a characteristic X-ray print of a case of Perthes' disease in a boy 8 years old, in whom a slight injury of the hip two years previously was the only known cause.

Recurring attacks of limping without pain or tenderness and a slight limitation of movements in abduction and internal rotation were the principal evidences presented. The X-ray established the diagnosis.—*Charles A. Parker, Chicago.*

**IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.**

**ARTHRITIS DEFORMANS FROM SURGICAL STANDPOINT.** R. Carothers. *Ohio State Med. Jour.*, February, 1916.

The article is a resumé of the generally known facts in regard to the infectious origin of this trouble, with the practical admonition to remove sources of infection as a prime necessity in its cure. He does go further than many general writers on this subject in demanding rest of the affected joints in plaster-of-Paris splints to prevent deformity and conserve motion,—a very important rule of practice and one only little appreciated by the general practitioner.

It should be added that in joints of the lower extremity the knees and hips should be supported in the completely extended position and the foot at right angles with the leg. In the upper extremity the shoulder should be in abduction, the elbow and wrist in extension. Exception will probably be taken to the extended position of the elbow, but resumption of motion is always easier in the completely extended joints than in the partially flexed ones.—*Charles A. Parker, Chicago.*

**THE RELATION OF GOUT TO NEPHRITIS, AS SHOWN BY THE URIC ACID OF THE BLOOD.** Morris S. Fine. *Jour. Amer. Med. Assn.*, June 24, 1916, p. 2051.

This paper is based on a study of five cases of gout and seven cases of incipient nephritis. The question arises, "Is gout merely a stage in the development of interstitial nephritis?"

"Is early interstitial nephritis merely potential gout?"

It is necessary to employ every possible test to exclude nephritis before a high blood uric acid may be regarded as evidence of gout in the absence of the typical classical clinical manifestations.—*Edward S. Hatch, New Orleans.*

**ARTHRITIS DEFORMANS FROM MEDICAL STANDPOINT.** J. Phillips. *Ohio State Med. Jour.*, February, 1916.

The writer distinguishes three etiologic classes of these affections, particularly as they may demand different therapeutic measures. They are the arthritides of gout, those of chronic diseases of the nervous system, tabes and

syringomyelia, and the large inclusive class of infectious arthritis. He suggests their careful differentiation as the necessary preparation for their cure. In the infectious type he advises the careful overhauling of the cephalic and caudal regions for infections, as well as the assumed less frequent affections of the intermediary abdominal viscera. He cites four histories of fairly typical cases in which vaccines from cultures from tonsils or teeth failed to give specific or desired results, and concludes that the best that can be hoped for in chronic cases is for the disease to become quiescent.

No mention is made of local rest of the joints, a very important local measure, whether the origin of the trouble can be found or not.—*Charles A. Parker, Chicago.*

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THE STREPTOCOCCUS VIRIDANS AND ITS RELATION TO ARTHRITIS DEFORMANS AND ENDOCARDITIS. Davis Spangler. *Texas State Jour. of Med.*, March, 1916.

The streptococcus viridans is one of the pneumococcic groups of bacteria. It occurs in chains or in pairs. They grow in almost any media. The characteristic cultures are on blood agar where they grow in small grayish green colonies surrounded by an area of greenish hemolysis. They are gram positive. They grow best between 30 and 35° C. Out of 20 persons with apparently healthy mouths, 16 produced positive cultures.

Almost every disease is due to some focus of infection. The usual foci are in the mouth, nose or pharynx, especially in the teeth and tonsils. Also in any part of the body, as in the appendix, genito-urinary system, gastro-intestinal tract, respiratory system, etc.

The history notes of 8 cases are given. Five patients suffered from arthritis deformans in the early stage or from a chronic arthritis. In 3 of them the *S. viridans* was obtained from teeth or tonsils, and vaccine treatment caused some improvement. In 2 the organism was not found. Two of the remaining cases had endocarditis, and in both the *S. viridans* was obtained from tonsils or teeth, and a vaccine caused improvement. The last case was one of sepsis following an accident—pyorrhea, pyuria, abscess of prostate. *S. viridans* and staphylococcus albus were present in the pus from the prostate.—*Walter G. Elmer, Philadelphia.*

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## V. SCOLIOSIS AND STATIC DISTURBANCES.

CAUSES, MECHANISM AND TREATMENT OF FLAT-FOOT. William Jackson Merrill. *Surg., Gynec. and Obst.*, March, 1916.

Merrill states that the causes of flat-foot are conditions which alter the structural relationships and lessen the power and tonicity of the muscles and ligaments. The habit of toeing-out is a very general cause. The paper is a plea for a search for the cause and its correction. Treatment should aim to strengthen the muscles and ligaments. In advanced cases of long standing, surgery is often necessary. The indiscriminate use of ready-made arch supports is unqualifiedly condemned.—*M. S. Henderson, Rochester, Minn.*

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## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

BIFURCATIONS OF TRANSVERSE PROCESS OF FIFTH LUMBAR VERTEBRA; REPORT OF CASE. W. Cunningham. *Wisconsin Med. Jour.*, June, 1916.

Cunningham records an instance in a man 33 years old who had been suffering from pain radiating down the right sciatic region for two months, coming on suddenly while stooping.

It was made worse "by walking up stairs, by flexion of the thigh with the leg extended, by deep pressure over the sacro-iliac region, or by flexion of the body to the right." The radiograph showed an elongated, enlarged bifurcated transverse process of the fifth lumbar vertebra on the left side, "which seemed to articulate with the ala of the sacrum on this side and to tilt the fourth vertebra to the right." An operation was performed for the removal of the process, and at the same time an injection of urea hydrochloride was made in the right sciatic, the painful nerve. This was followed by manipulations with the hope of correcting the malposition of the 4th lumbar vertebra. After three months' care all symptoms had disappeared and since that time the patient has felt perfectly well.

The natural query in the discussion was "why did he have right-sided pain when the lesion was on the left side?" Dr. Cunningham's answer was, "the body was tilted to the left and the man stood in about the position I am at the present time"—no diagram. "The flexion of the body would indicate that the pressure upon the nerve trunks that go to make up the sciatic nerve produced the pain."

The relief of the patient, after all, is the main thing, but our explanations are often truly marvellous!—*Charles A. Parker, Chicago.*

#### VIII. TRAUMATIC LESIONS, FRACTURES, AND DISLOCATIONS.

SPLIT TENSOR FASCIÆ FEMORIS. Leo Bernd. *Jour. Amer. Med. Assn.*, May 20, 1916, p. 1619.

This interesting cause of dislocation of the hip on slight adduction was proven by operation; and the patient cured by sewing up a slit four inches long in the tensor fasciæ femoris.—*Edward S. Hatch, New Orleans.*

COLLES' FRACTURE. WILLIAM FRANCIS CAMPBELL. *Medical Times*, May, 1916.

A very clear and concise résumé of the various anatomic features in this fracture and the reasons for the five deformities existing in them, namely:

1. Prominence of the fragment at the back of the wrist.
2. Hand thrown radial-ward.
3. Prominence of the ulna.
4. Widening of the wrist.
5. Shortening of the radius.

A most important peculiarity is the usual absence of crepitation due to impaction.

The author emphasizes the change in the joint line in the radio-carpal articulation. Normally, the radial styloid is half an inch lower than the ulnar; in Colles' fracture they are nearly on a level.

He states that it is a "hospital fracture" and not an office fracture, and should be thoroughly reduced under anesthesia. Manipulation as follows: Forearm brought to right angle and supinated. Traction is then made on the flexed hand, counter-pressure on the upper fragment. With steady traction, the impaction is broken up and the fragment replaced.

In this position the supinator longus is relaxed and traction in flexed position used because of the pull on the fragment through the anterior carpal ligament,—a fact heretofore not sufficiently emphasized.

The author does not think the specially devised splints for this condition are of value; he prefers plain, well-padded palmar splints from elbow to base of fingers.—*C. L. Lowman, Los Angeles.*

**KNEE-BLOCK FROM AVULSION OF BONE FRAGMENT BY POSTERIOR CRUCIAL LIGAMENT.** Roscoe R. Kahle. *Jour. Amer. Med. Assn.*, July 1, 1916, p. 33.

In the case of knee-block reported by Kahle, following a fall with the knee semi-flexed and leg abducted, X-ray showed a loose bone fragment in the joint, supposedly torn from the outer edge of the inner femoral condyle, this being confirmed by operation. It is the author's conclusion that this avulsion of bone was caused by the pull of the posterior crucial ligament as it ruptured, though the uncertainty of the mechanism, and the resemblance of the condition to "osteochondritis desiccans," leaves this open to some doubt.—*Eben W. Fiske, Boston.*

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**REPORT OF A CASE OF SACRO-ILIAC STRAIN FOLLOWING SYMPHYSIOTOMY.** Charles F. Painter. *Boston Med. and Surg. Jour.*, June 22, 1916, pp. 910-912.

A healthy married woman of thirty years became a nervous invalid following her first childbirth, which was accompanied by a symphysiotomy. Four years after the event an X-ray showed wide separation of the pubic bones at the symphysis, with marked lipping of sacrum and ilia at sacro-iliac joints. Operation of wiring the two pubic bones, fixing them in closer proximity to each other resulted in relief of disability in walking, and other sacro-iliac symptoms.—*H. W. Marshall, Boston.*

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**SUBLUXATION OF THE HEAD OF THE RADIUS.** C. A. Stone. *Jour. Amer. Med. Assn.*, July 1, 1916, p. 29.

From observation of a case of repeated subluxation of the head of the radius and subsequent experiments on the cadaver, the author believes the mechanism is produced by traction with the forearm in pronation, as in this position the flat side of the radial head can slip out from under the annular ligament. It is not necessary for the biceps to be contracted on the forearm adducted, as has been previously claimed.—*Eben W. Fiske, Boston.*

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**A CASE OF OS TIBIALE EXTERNUM SIMULATING FRACTURE OF THE NAVICULAR BONE.** C. P. G. Wakeley. *The Lancet*, Apr. 29, 1916.

A case is reported where upon examination of an injured foot the fluoroscope showed a separate piece of bone near the navicular which was thought to be a fracture. Examination of the other foot, however, disclosed the same condition. Os tibiale externum is then discussed.—*F. G. Hodgson, Atlanta.*

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## IX. MISCELLANEOUS DISEASES, GENERAL ORTHOPEDIC ARTICLES, PHYSICAL THERAPY, APPARATUS, ETC.

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**TWO CASES OF BONE GRAFTS.** J. T. Nix, Jr. *New Orleans Med. and Surg. Jour.*, May, 1916.

Two cases are reported, one for relief of a compression fracture of the body of the 9th dorsal vertebra and one for tuberculosis of the 1st and 2d lumbar vertebrae. Good results were obtained in both cases.—*Edward S. Hatch, New Orleans.*

## X. WAR SURGERY.

TRENCH FOOT TETANUS. George G. Davis and Joseph J. Hilton. *Jour. Amer. Med. Assn.*, June 17, 1916, p. 1916.

One case of trench foot tetanus followed by death is reported and a plea is made to consider all cases of trench foot due to tetanus and that these patients be given a prophylactic dose of antitetanic serum.—*Edward S. Hatch, New Orleans.*

TREATMENT OF FRACTURES IN THE FIELD AMBULANCE. E. Vidal. *Paris Médical*, April 1, 1916, vi, No. 4.

E. Vidal gives the classification laid down by Lejars in his treatise on gunshot fractures. In the first category he treats of complicated, non-comminuted or slightly comminuted, non-vascular lesions, no important muscular attrition, and a small skin wound. In many fractures of this description, healing took place after the parts had been treated with iodine, and the limb immobilized; but such was not by any means the usual happy result. He places no reliance on the size of the opening in the soft parts in forming a prognosis.

Second Class.—Fractures, complicated, comminuted, without grave vascular lesions, and large muscular and skin lesions. In this class, cleansing the parts, removing only those fragments which are loose; the others are left for regeneration of callus and bone. Resection never to be resorted to at this stage.

Third Class.—Fractures, complicated, soiled and infected, which were formerly subjected to immediate amputation, but now treated by cleansing, and frequently saved. The treatment of gunshot fractures resolves itself in three words: cleanse, protect and immobilize. In the present war the wounded receives first aid in the trenches; then he is transferred to the regimental port of relief, where the fracture is more minutely dressed and immobilized.

At the ambulance, for the severe fractures, those where there exists much laceration of soft parts, and much comminution of bone, and where the patient is suffering from very pronounced shock, nothing is done before the patient has rallied from the shock. The patient is roused from his shock by injection of Ringer-Locke serum, in 250 to 1000 c.c., to which is added frequently  $\frac{1}{2}$  to 1 c.c. of a 1 to 1000 adrenalin solution.

Next follows cleansing of the whole limb, cleansing of the wounds and of the tracts and extraction of foreign bodies, cleansing and removing loose fragments of bone, drainage and coaptation of fragments and immobilization in splint and bandage. Alcohol, ether, iodine and oxygenated water are used freely in cleansing the wounds, care being taken not to use force in throwing in the water.

For drainage, a large caoutchouc tube, without side openings, wrapped with gauze, is shoved down to the seat of fracture, and through this tube Dakin's liquid is poured every hour down to the seat of fracture.

To immobilize the fragments, preference is given to plaster of Paris, in different forms, to meet the exigencies of each case. He gives great praise to the apparatus of Delbet, which permits the patient to walk about without pain, in fractures of the lower limb, immediately after the fracture is reduced. The objection to its general use is found in the price, quite in contrast to the cheapness of plaster of Paris.

He concludes his article by saying that all compound fractures, coming to the ambulance, should be thoroughly cleansed and drained, reduced by continuous extension until reduction is complete, as indicated by radiographic examinations, and maintained in apposition by plaster of Paris.—*Daniel La Ferté, Detroit.*

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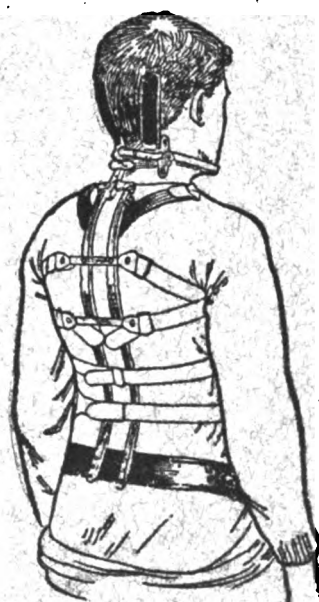
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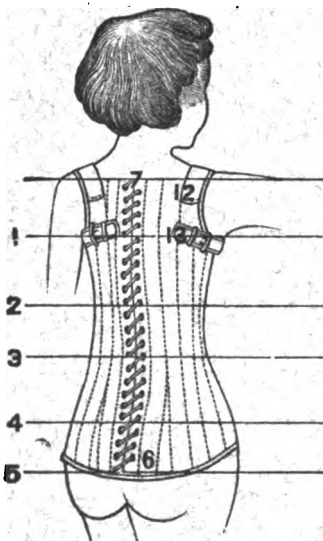
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# *The American Journal of* **Orthopedic Surgery**

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## THE STANDARDIZATION OF CONDITIONS AFFECTING POSTURE.

BY HENRY LING TAYLOR, M.D., NEW YORK, N. Y.

BESIDES the intrinsic factors, many external conditions exert an important influence for good or evil upon habitual postures.

These external conditions may be divided for convenience into the environmental and the personal. Under the first head would come occupations, as in school, factory and shop life, practically compelling certain habitual postures; and under the second the compulsion and limitation imposed by prevailing forms of dress, garment suspension, shoes and the like.

It is evident that these are all matters which vitally affect posture, and through it health and efficiency, and which may be investigated and studied scientifically. The principles which should underlie the construction of clothing and seating, for example, should be scientifically worked out, made known, and applied.

For the last three years a group of experts, several of whom are members of this Association, have been working on these problems in the technical committees of the American Posture League, Inc., and the purpose of this paper is to report some of the results so far obtained, especially in seating.

It is evident that such work should be based upon a study of the form, types, and measurements of different parts of the human body, and its favorable and unfavorable postures under given conditions of work and rest, and that clothing and furniture should be so modified as to favor good postures, comfort and efficiency.

Anatomical data, such as the committees needed, were scanty or wanting, so that in several instances, questionnaires were sent out by the



Anatomic Subway Car Seat.

League to its members, and the results were tabulated, classified and studied. Such investigations, with other experimentation and research, formed the basis of the work of the various technical committees.

The principles of correct seating require comfortable support of the feet, thighs and seat, and usually of the back in good posture for work or rest, as the case may be. The seat should be of a height to permit the feet to rest comfortably on the floor, or a foot rest; the legs should not dangle. The floor of the seat should be so modeled as to favor sitting with the pelvis as close to the back of the chair as possible; this prevents sliding forward, and distributes the pressure between the thighs, seat and ischia. The front edge of the seat should be rounded and should relieve the popliteal region of all pressure. The back of the seat should have a slight backward slope, as a whole, varying in degree, according to its use. In order to avoid pressure over the buttocks, and to fit both straight and hollow backs, the back of the seat should have an ample space or recess, immediately above the seat floor. The first support to the back should be at the lumbo-sacral region, and this should be carefully modeled to avoid pressure over the spine or ilia. If sliding forward is checked by correct modeling of the seat floor, support at the lumbo-sacral region practically locks the pelvis, and makes the slump posture difficult, if not impossible. If the upper back is to be supported, it should be in the lower and mid-dorsal region, extending somewhat above the level of the lower angles of the scapulae, to avoid pushing up the shoulder blades. The



American Posture League outflared shoe with ample space on the outer border.



Outflared shoe—front view.

back should be flat sideways or only slightly concave, to avoid pressing the scapulae forward.

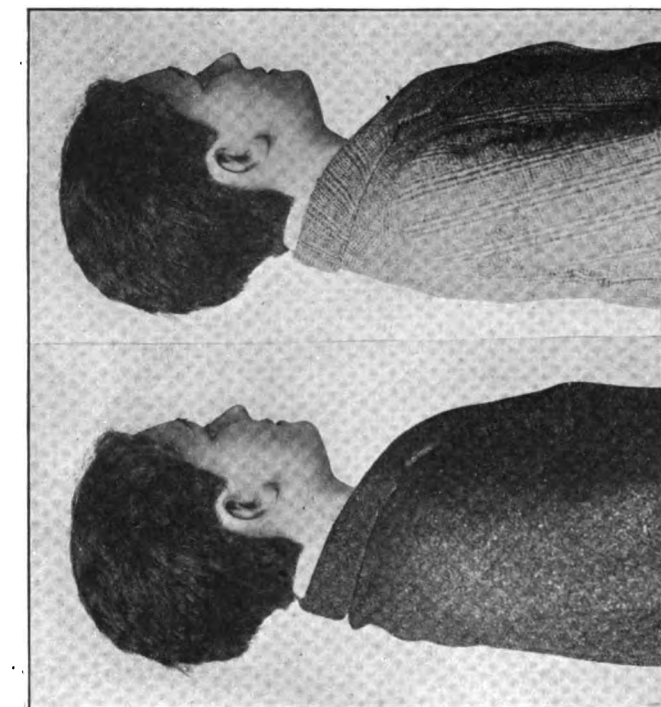
If the chair has arms they should be of a height to carry the weight of the arms comfortably, and the modeling should not push the arms too far forward.

Seats should be designed with reference not only to the shape, size and function of the body, but also with direct reference to the use for which they are intended.

Seats in public vehicles are notoriously uncomfortable and unhygienic, and it was, therefore, with great interest that the League's Technical Committees on Furniture undertook, by request, the designing of the seats in the new Brooklyn Rapid Transit subway cars in conjunction with that Company's engineers. After much study and experimentation, a model was officially approved by the League, and seats of this type are now in use on the Brooklyn subway. It is believed that this is the first seat in a public conveyance to be designed in coöperation with hygienic experts.

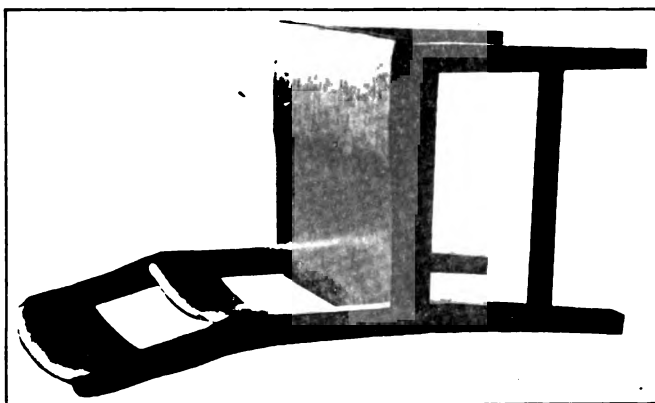
A standard school chair was remodeled by our Furniture Committee to conform to hygienic standards, and has proved very satisfactory in actual use. Kindergarten and vocational chairs have also been designed and tested, and arrangements have been made for their manufacture. The Committee is now working on office chairs, and will soon take up industrial and auditorium seating.

Noticing the unsatisfactory fit of boys ready-made coats, the matter was investigated by one of our members, and it was found that they were made over round-backed models, and were too loose at the back



Straight Posture—showing correct fit and remodelled Posture League coat.

Straight Posture—showing poor fit in back of commercial coat.



American Posture League school seat, made in different sizes.

and too tight across the chest, pulling the shoulders forward, and virtually compelling a round-back posture. The matter was taken up with a large manufacturer, and coats were remodeled to a correct design.

After extended inquiry, no scientific basis could be found for the prevailing shapes of commercial footwear. The so-called orthopedic or inflated shoe has resulted from coöperation with orthopedic surgeons, but has been designed with the idea of overcoming or preventing pathological conditions, and it is notoriously unacceptable to many feet.

The whole subject of the shapes or types of average feet appeared to the technical committee having this subject in charge, to call for investigation. It seemed particularly desirable to know what were the variations in the ground plan of the foot, as it would seem that a shoe should be built on a base which would approximately conform in shape to the outline of the foot.

Data were gathered in this country and from the unshod people of the Orient, which showed that feet might be divided into three types,—the inflated, straight and outflared. The classification related to the ground plan of the foot, and is not dependent upon the direction in which the foot is turned or the toes deflected.

This discrepancy in types of feet explains much of the difficulty of shoe-fitting, and the discomfort of shoe-wearing. It follows that no one type of shoe can fit all types of feet, and that three types of shoes should be constructed to correspond to the types of feet.

Shoes of the three types have been prepared and tested, and arrangements have been made with a manufacturer to put them on the market.

The time allotted is too short to describe at length the Mosher-Lesley schematograph, approved by the League, a camera-like instrument, which enables one to trace the reduced outlines of the body on a horizontal surface for the study and record of posture, or the results of an important investigation undertaken by a special committee, on the relation of the position of the abdominal viscera, as shown by the X-ray, to posture, breathing, clothing and movements. An account of these and other lines of research must be deferred to another occasion.

In order to protect the public, as well as the Posture League and the manufacturer, all material endorsed by the American Posture League bears its official label of approval. In this way the manufacturers who reap a commercial benefit from the League's activities contribute to its expenses, and assist in the movement.

It is the intention of the League to make its label stand for sound scientific work, that shall contribute to human health, comfort, and well-being.

## FIXATION OF THE SACRUM.

BY E. H. ARNOLD, M.D., NEW HAVEN, CONN.

THE sacrum is movable in three joints,—the sacro-lumbar and the two sacro-iliac joints. Under the sacro-lumbar joint are comprised the joint surfaces between the lower aspect of the body of the fifth lumbar and the upper aspect of the body of the first sacral vertebra, as also the two joints between the articular process of the fifth lumbar vertebra and the sacrum. Disturbances of the normal relations in these joints between sacrum and fifth lumbar vertebra and sacrum and ilia are usually participated in to a greater or lesser degree by all of these articulations. I shall, therefore, not describe the derangement of relation in every joint, but taking the normal attitude of the sacrum as the standard, describe the abnormal positions of the sacrum, from which abnormal positions the several changes in the various joints before mentioned can readily be deduced. I shall not enter into any detailed anatomical description of the bones or joints here considered, nor of their functions, assuming these to be too well known to need reiteration.

The several faulty positions of the sacrum may be described as:

A. Tilting forward. A rotary movement forward around some broad axis, traversing the sacrum at any height or any depth of it. The section of the sacrum lying above this axis moves forward, while the section lying below it moves backward.

B. Tilting backward. A rotary movement around the same kind of an axis as above, backward. In this case the upper section moves back, the section below the axis forward.

C. Sinking downward. A movement of the sacrum in more or less vertical manner downward, accompanied or unaccompanied with more or less tilting forward or backward. If the sinking down be of the sacrum as a whole, the movement occurs in both sacro-iliac joints.

D. Turning left or right. A rotary movement around a longitudinal axis of the sacrum. This axis may lie at any depth or any width of the sacrum. The section of the sacrum lying to the left of the axis moves back, the one to the right moving forward in turning left; the turning right being the corresponding movement to the other side around the same kind of an axis.

E. Tilting left or right. A rotary movement around a deep axis of the sacrum at any height or width of it. To the left if the section to the left of the axis sinks down, the right being stationary in the joint or slipping up. Tilting to the right is the reverse.

F. A movement forward of the sacrum as a whole, without any tilting.

G. Movement backward of the sacrum as a whole, without any tilting.

The causative agent for any of these abnormal positions of the sacrum and the resulting disturbances in the joints by which it is brought to the neighboring bones may be:

1. Faulty distribution of the superincumbent weight. Under this heading would come the weight falling in improper direction or amount on the upper part of the sacrum in consequence of:

- a. Lateral and abnormal antero-posterior curves of the spine.

- b. Disarrangement of the proper statics by structural or functional shortening of one or the other lower extremity from various causes.

2. Diseases of the sacro-lumbar or sacro-iliac joints. Here we would have:

- a. The destructive lesions of infections.

- b. The degenerative lesions of toxic arthritis of these several joints.

3. Destructive lesions of the body of the fifth lumbar vertebra.

4. Destructive lesions of the sacrum in the neighborhood of one or the other of the joint surfaces under consideration or of the sacrum as a whole.

5. A combination of one or more of the four lesions enumerated. For the present consideration the sequence of events in cases of these combinations is of mere academic interest and will, therefore, not be discussed.

6. Trauma, resulting in sprain, subluxation or dislocation of one or the other, or any and all of these joints. A discussion of the nature of the trauma or of the nature of the destructive lesion of bone or joint, or the degenerative lesions, is again omitted as being, on the one hand, sufficiently gone over, and, on the other hand, disputed territory and for the present clinical consideration only of academic interest. Suffice it to say that the various forms of trauma, either one pronounced injury or a series of small injuries, will be found to have existed in a series of cases.

Likewise, the various forms of arthritis and osteitis will contribute a number of cases. Few cases of this type will ever come to the post-mortem table and a minute pathology of this type of case cannot be established unless special attention, in institutions where post-mortem material is plentiful, should be paid to this particular point. Of this attention there is as yet little chance.

Some tests, such as tuberculin tests for the establishment of the



presence or absence of tuberculosis, might have been made, had this series been undertaken from the beginning with the idea of making it the subject of a thesis. As, however, the arrangement of the series for this purpose is a post-festum event, such tests have not been made. Nor would, in case of these tuberculin tests being positive, the result have been helpful. Since tubercular lesions might readily exist in other parts of the body, the positive test would not warrant the conclusion that in any particular case where other evidence of local tuberculosis in this region was missing, the local lesion is tubercular.

#### SYMPTOMS.

It is undoubtedly true that distortion of the sacrum in any and all of the forms above mentioned may exist to quite a degree of severity without any symptoms. On the other hand, even slight distortions may be accompanied by rather severe symptoms. The symptoms may come on gradually and increase in severity as the distortions continue to increase. The symptoms may be intermittent, periods of freedom from symptoms being followed by periods when the symptoms are well pronounced. The symptoms may be constant day and night, without interruption, presenting from time to time periods of exacerbation. These exacerbations are sometimes traceable to distinct causes. At other times they come on without apparent cause. The symptoms may be divided into local and general.

The most pronounced local symptom is pain. This pain, except in such cases where it is referred to a distinct nerve trunk, is usually dull. The pain is localized in the small of the back on both sides of the lumbar vertebra. In certain cases the pain is distinctly referred to the sacro-lumbar joint. In other cases the pain is referred, without distinct demarcation, to the sacral region. In some cases, one or both of the sacro-iliac joints are the seat of pain. The pain radiates into one or both legs, very commonly being referred to the upper course of the sciatic nerve, though pain in the outer side of the heel was experienced in some cases.

This pain, in the first place, is a subjective symptom. The description of its severity depends somewhat upon the nervous make-up of the patient. However, one usually succeeds in locating, by light pressure, areas of exquisite tenderness, sometimes of excruciating pain in one or the other of these localities. In these cases the subjective pain is found to be increased usually on standing and walking, especially on walking upstairs. Carrying of burdens and bending of the trunk forward,

sometimes left and right, increases it. In certain cases lying on the back or on the side increases the pain, and comparative freedom from it can be gotten only if the patient lies face down.

Closely associated with the symptom of subjective pain is the symptom of subjective limitation of movement, *i.e.*, the activity of the patient is limited by the pain in one or another way. All of the movements that were mentioned before as increasing the pain are, on account of the pain, performed by the patient to a limited degree only or not at all. So we have limping with the leg in which sciatic pain is experienced. Sitting down and getting up are extremely painful, are executed with extreme caution by the patient, a good many times with the aid of the arms. The trunk is oftentimes held rigidly erect. The hands are placed on the small of the back in an endeavor to diminish pain or to steady the movement.

The pain symptoms and their peculiar location may be explained by the relation of the lumbar and the sacral plexus to the lumbar vertebrae and the sacrum. The transverse processes of the lumbar vertebrae are able undoubtedly to make pressure upon one or the other branch of the nerves that make up these plexus. The pain referred to the sciatic nerve is more difficult of explanation if one remembers the great thickness and tensile strength and tolerance to injury that this large nerve trunk has undoubtedly in common with most large nerves. The disturbance of the position of the sacrum in the various tiltings and escapes here mentioned might have an influence on the direction of the large sacro-iliac ligament to such an extent that it would more or less crowd the obturator foramen and load on its sharp edge the nerve, thus causing in time a pressure neuritis. The objective symptoms are limping on one side in walking; inclination of the trunk to one side in standing; aggravation of the lumbar lordosis or obliteration of it; change in the direction of the sacrum; greater or lesser prominence of one or both sacro-iliac joints; rigidity of the lower spine; in some cases limitation of leg movement, as is found in psoas involvement; in cases of well-marked involvement of the sacro-iliac joints, limitation of rotation of the thigh on one or both sides, in or outward, or both.

#### GENERAL SYMPTOMS.

The general symptoms are those due to the causative agent, if it is such as will produce general symptoms, thus: where infectious arthritis or osteitis is the cause, we may and should expect the general symptoms that go with such an ailment. We have, then, fever, malaise, loss of

strength, loss of weight, similar symptoms in toxic arthritis. In certain other cases the general symptoms, however, are due to the local manifestation, especially pain. The pain is so constant in some, so excruciating in other cases, that restlessness, sleeplessness, loss of strength and loss of weight are induced by the pain.

#### DIAGNOSIS.

The diagnosis of a distortion of the sacrum, with involvement of one of the sacral joints, is made in the first place by the history of the case. Where there is a history of well marked trauma the trauma usually points the way to a diagnosis. In cases where there are repeated small injuries of an occupational character, a careful history taking will once more guide one to a diagnosis.

It is different where the history is simply that of backache, and more so if the backache is not particularly well localized and is intermittent. In a recent case of this kind, it will take careful search to localize the trouble. Fortunately for purposes of our diagnosis, unfortunately for the poor patient, the history is usually entirely different, the backache is of considerable duration,—months and years, sometimes many years, of it have been experienced. All kinds of diagnoses have been made: lumbago, sciatica, muscular rheumatism, kidney trouble, neuritis are some of the common terms under which the trouble has gone. In the case of females, the long list of uterine and ovarian troubles that might cause backache is added. The treatment has been in keeping with the diagnosis; anti-rheumatic treatment, electricity, heat, and massage for muscular rheumatism and neuritis, all kinds of medication, the salicylates and bromides predominating, have been tried. In the case of suspected female trouble, topical application, pessaries, even removal of some of the internal genitalia have been resorted to, all to no avail. Such a history should lead one to a careful local examination.

The diagnosis then rests upon the localized pain, the rigidity, the interference with function, the change in form and direction of the bones and joints. In the last instance it should be supported by X-ray findings. Unfortunately X-rays of this region are, even in the hands of experts, not always satisfactory. They should be taken after some preparation of the bowels. The bowels, especially the lower bowel, should be carefully emptied before X-ray examination. Even then, as pictures can practically be taken only from before backward, the information given is really not positively diagnostic. It must be con-

sidered in conjunction with the symptoms and history of the patient in order to be conclusive. Pictures from back forward are unsatisfactory pictures; from side to side in this region they are practically impossible as far as their showing the sacrum or the sacro-iliac or sacro-lumbar joint is concerned. There is a slight chance of stereoscopic pictures from before backward giving a little more information. I have not had a chance to try them.

#### ETIOLOGICAL DIAGNOSIS.

Where the history of trauma is plainly laid out, no trouble in finding the etiological factor exists. Where the rest of the spinal column, or in the absence of symptoms there, other joints show marked symptoms of arthritis, the etiological factor may be assumed to be the same; the general and special symptoms of tuberculosis can be established. The diagnosis of tubercular arthritis or osteo-arthritis may be made in the absence of tubercular lesions elsewhere in the body.

#### DIFFERENTIAL DIAGNOSIS.

A careful examination of the urine, of the urinary tract as far as accessible, should be made. In the case of females, a bimanual should first rule out any such trouble of the genitalia as might cause the above symptoms. When by these examinations other causes have been excluded, the diagnosis of sacral distortion may safely be made. A gentle but deep-going massage of the muscles of the lumbar and sacral region may have to be resorted to as a clinical way of excluding myositis. With the diagnosis made, we approach treatment.

#### TREATMENT.

The lighter forms of distortions of not very long standing, except those that are dependent upon toxic arthritis, may yield, and sometimes surprisingly quickly, though not always permanently, to such slight measures as rest in bed, the application of heat in the form of dry air or thermo-penetration, together with a well directed massage of the muscles and joints. This should always be tried in the absence of X-ray findings, that would indicate serious lesions. Strapping, as hereafter to be described, may help the matter along.

Where, however, a real distortion of the sacrum has taken place, has been of considerable standing and has thereby caused more or less

change in the joint apparatus, fixation of the joint becomes imperative. Adhesive plaster strapping will oftentimes be efficient where we deal with a disarrangement of one sacro-iliac joint only and one of mild degree. In order to lock the joint more securely, the point of application will be on the anterior aspect of the rim of the ilium, from there going across the sacro-iliac joint obliquely downward to the opposite side, fastening there once more on the lower part of the anterior iliac crest. Two strappings crossing one another, and one horizontal one between the two may support the joint enough to bring about recovery. Where, however, severe antero-posterior tilting in either direction, severe lateral tilting, or rotation, or forward or backward displacement as a whole has taken place, no permanent fixation can be gotten by this means. The mechanics are such that a pushing backward of the crest of the ilia may approach the iliac surfaces of the sacro-iliac joints, and if so be that the sacrum is still in contact with all or most of these joint surfaces, it will firmly grasp it. If, however, it has escaped to any considerable extent on one or both sides, no fixation is possible, but the trouble will be aggravated in the nature of the thing. Adhesive plaster strapping can have no effect whatsoever upon the sacro-lumbar joint.

Flexible belts that make their traction in a circular manner will compress the ilia anteriorly, and therefore disapproach the iliac surfaces of the sacro-iliac joints, making the joints more insecure and aggravating the trouble, if anything. Such belts again have no influence whatsoever on the fixation of the sacro-lumbar joint. Strapping or belts with pressure pads upon the sacrum, in cases where the tilting is backward, may accomplish the re-position. Here the belt, because it opens the joint forward, has a better chance of replacing the displaced sacrum than the strapping, which locks the joint. The pad may, if well applied, do some good in conjunction with the belt in a unilateral displacement.

In cases of rotation, sacro-spinal braces with a suitable waist band might seem indicated to fixate the sacro-lumbar joints. In all those cases, however, where the lumbar lordosis is increased, the pressing of a brace against the spine and sacrum will increase the trouble rather than relieve it. In backward tilting of the sacrum, the sacro-spinal brace should theoretically be helpful; practically, however, the prolongation of the brace below the pelvic belt is so short that it has no leverage, and therefore is mechanically inefficient. While I have tried it in quite a few cases, it has been the most disappointing of all the mechanical means for relieving the trouble.

Having given these remedial agents a trial and they having failed,

one is justified in approaching the fixation of the sacrum in an operative way. The fixations necessary are plainly those, first of the sacro-lumbar, second of the sacro-iliac joints.

Where we deal with the sacro-lumbar disturbance which has had no sacro-iliac disturbance as a consequence as yet, fixation of the sacro-lumbar joint may suffice. It might seem that the same reasoning should hold good with regard to the sacro-iliac joint or joints, namely, that where we deal with disturbance of the sacro-iliac relation of one or both joints only, fixation of one or both should be sufficient. However, it is difficult to think of a sacro-iliac disturbance without a consequent sacro-lumbar one. As a matter of empiric opinion, I should say that except in traumatic cases, the origin of the trouble is usually in the sacro-lumbar joint to begin with. Wherefore nearly all cases ask for the fixation of at least the sacro-lumbar joint, and one or both, as the case may be, sacro-iliac joints. I have not dared to fixate the sacro-iliac joint or joints only. I have had good results from the fixation of the sacro-lumbar joint only. In but two cases was it, in my opinion, necessary to fixate both iliac and the sacro-lumbar joints. In most cases fixation of the sacro-lumbar and one sacro-iliac joint has sufficed.

#### TECHNIQUE.

First, sacro-lumbar operation.

The most satisfactory results have been attained where two grafts taken from the shin bone in the usual method have been implanted on the two sides of the spinous processes of the last three lumbar and the first two sacral spinous processes. For this purpose a longitudinal incision directly over the tips of the spinous processes is made through skin and fascia. Muscles and periosteum are stripped off on either side, quite down to the lamina. The bony surfaces are somewhat roughened by scraping with spoon or chisel. The grafts are inserted on both sides, securely sewed in with heavy strands of kangaroo tendon, the fascia is closed with interrupted chromicized catgut, No. 1 or 2, when next the skin wound is closed by No. 1 plain catgut, continuous suture, dressing as usual. The patient is put to bed. The first three cases I encased in long plaster-of-Paris spicas. Since then, however, I have discarded the use of plaster of Paris altogether. The results are just as satisfactory.

Second, technique for sacro-lumbar fixation.

Following the method of Albee, I have split open the last three lum-

bar and the upper two sacral spinous processes longitudinally and have inserted the graft in the usual manner. The grafts after all these operations have taken. In those with considerable increase of the lordosis, the angle at the sacro-lumbar joint has been so acute as to make shaping of a graft impossible. I have here had to break the grafts in two pieces, inserting the upper on the left, the lower on the right side of the processes, having the grafts overlap at the broken part a half an inch or more. In these cases, I should say a prolonged rest is indicated. While six weeks has been the usual duration of rest in bed, I should make it here seven or eight.

Third, fixation of the sacro-iliac joints.

One or two grafts an inch and a half to two inches long, each of the usual description, are removed from the shin bone. By a transverse incision, the lower part of the sacro-iliac joint is bared, a trough is chiseled across the ilium and the sacrum, penetration being made into the joint, so as to have raw bony surface on the adjoining joint surfaces instead of cartilage. The graft is inserted into the trough, fastened with kangaroo tendon, the muscle and fascia sutured with deep interrupted sutures of chromicized catgut No. 1 or 2, and the skin closed with No. 1 catgut, continuous suture. Rest in bed for six weeks completes the treatment. Apparently all of the grafts have taken. There has been primary union in all the wounds of this series. In the three cases where tuberculosis was assumed to be the factor, and where a temperature of low degree had been running before operation, temperature of 101 and 2 for a day or two after the operation, coming down within five or six days to 99 and then receding to normal in the morning, staying around 99 in the afternoon, has been the febrile history. In the traumatic cases and those of toxic arthritis, an absorption fever for four or five days has been noted. After that the temperature has become normal.

#### POST-OPERATIVE MANAGEMENT.

The patient has been allowed to sit up, but not in bed, since sitting in bed with legs straight would put undue strain upon sacro-lumbar and sacro-iliac joints, but the patients have been made to sit in a rolling chair or with the legs to the knee hung over the edge of the bed. Practically all of them were able to walk within a day or two after sitting up. All of the cases have been decidedly improved immediately. With some of them the cessation of pain was noticed in most agreeable manner directly after the patient came out of ether, and continued without

interruption from then on. In other cases, those of tubercular nature or those where the trouble had been established for years, recovery has been slow, absolute freedom from pain not being attained sometimes for two or three months, in one case not for six months, after operation.

#### MEDICAL TREATMENT.

It stands to reason that, since the operation treats the trouble in a mechanical way only, the arthritis or osteitis that caused the trouble to begin with, should receive such attention as it deserves. In toxic arthritic cases, a proper diet and relief of constipation are certainly indicated. For medicinal treatment of arthritis, I find the use of creosote, in the form of creosotal, three drops three times a day, the use of pyroligneous acid, half a teaspoonful to a half glass of water after meals, three times a day, helpful. I also employ ichthyol, five grain pills after meals, three times a day. Close attention to the teeth, to the tonsils, to prevent re-infection or absorption of toxins from these locations, are in the nature of routine treatment with me in all joint troubles, and, therefore, in these.

#### CASE HISTORIES.

CASE 1. F. A. L., female, 33 years, married, housewife, four children.

HISTORY. For fourteen years pain in the small of the back, constant, persists at night, exacerbation at time of menstruation. After the birth of the last child two years ago, the pain became much worse, unable to do housework, walking painful and difficult. Has had various forms of treatment off and on during the whole fourteen years; has lost considerable weight.

EXAMINATION, SEPT. 19, 1910. Patient is emaciated. There is no rigidity of the spine. The sacro-iliac joints are tender on pressure. The sacrum is tilted forward, making the lower end of the sacrum with the sacro-coccygeal joint very prominent. No limitation of movement in hip joints. Examination of urine negative, bimanual examination negative.

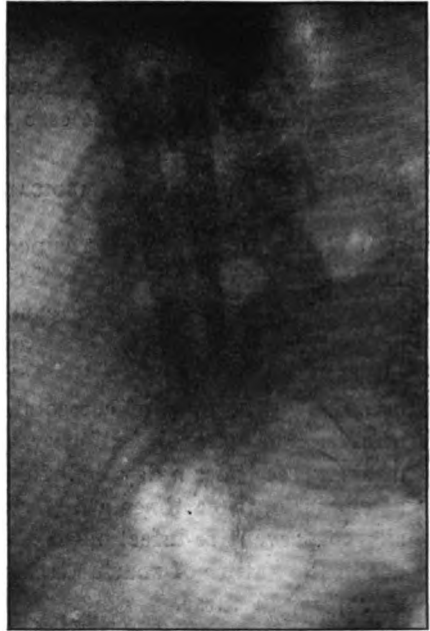
X-RAY EXAMINATION, PLATE 396. The sacrum is rather wide at the upper part. Its upper boundary, being practically on a level with the crest of the ilia, an irregularity, as of a destructive lesion, is seen on the very top and middle line of the sacrum.

TREATMENT. Adhesive plaster strapping gives relief for a short time; heat and massage likewise relieve for a limited time. A spinal brace does not give any relief, the symptoms progressively growing worse.





CASE 1. Before operation.



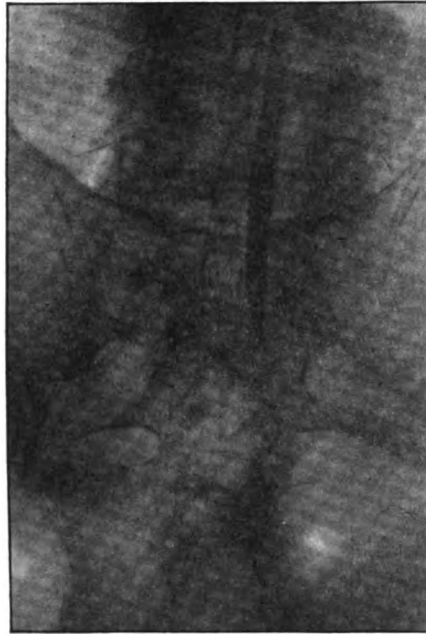
CASE 1. After operation.

The patient is put in a plaster-of-Paris bed, where she stays for one year. The pain disappears; the patient gains weight, and when at the end of this period she gets up, she is able to walk and do light housework without return of pain or inconvenience. The exertion contingent upon moving to a different residence brings back the whole trouble, with very much pain. The patient, getting progressively worse, is operated upon March 31, 1912. Two grafts alongside of third, fourth and fifth lumbar and first and second sacral spinous processes are inserted. The patient is kept in plaster-of-Paris bed for six weeks, when she gets up and walks without pain or discomfort, since which time she has had no disturbances; is about and does her housework.

CASE 2. A. McD., male, 50 years, married, laborer.

HISTORY. Twenty-four years ago had a severe fall on the back, since which time pain has been practically constant in the small of the back. About three months ago a turn for the worse set in, and for four weeks the patient has been confined to bed. The pain has been agonizing. There has been considerable loss of weight, the patient being much emaciated when seen.

EXAMINATION, MARCH 28, 1911. The patient is in bed and can only with great difficulty and under great agony be put in the several posi-



CASE 2. After operation.

tions necessary for examination. The spine is rigid, the sacro-iliac joints tender to pressure, the thighs resist extension, the patient is unable to sit, stand or walk. The pain is constant. Urine examination negative.

**TREATMENT.** The patient had had anti-rheumatic treatment for the last couple of months without avail. Strapping proves of no benefit, so the patient is put into a plaster-of-Paris bed April 1, where he stays for several months. The pain gets much better, the patient gains in weight and in general health. He finally insists on getting up, and a spinal brace is put on June 5. This enables him to be about with some pain and considerable discomfort. He is unable to walk much; can, of course, not work; and his general health is once more unsatisfactory. A double inguinal hernia hinders very tight application of the apron of the brace, and the brace interferes with the proper adjustments of the trusses, whereupon the patient finally consents to an operation. On February 4, 1912, the patient can be persuaded to come for an X-ray examination.

**X-RAY EXAMINATION, PLATE 532.** Possibly a lesion in the middle and to one side of the sacrum.

**OPERATION, MARCH 30, 1912.** A graft is placed alongside the third, fourth and fifth lumbar and the first and second sacral spinous proc-

esses, one over the left and one over the right sacro-iliac joint. The patient is placed in a double long plaster-of-Paris spica. On April 27, removing the front part of the plaster spica, and while the patient is still retained in it, operation for double inguinal hernia is done. Six weeks after first operation, the patient leaves the hospital and returns home, makes an uneventful and complete recovery. About three months after first operation, he puts the value of the operation to the test by falling down the cellar steps and landing on the back. Though considerably bruised, no harm was done, and the man returns to work, without interruption and without recurrence of his trouble.

CASE 3. R. M. A., male, 31 years, married, merchant.

HISTORY. In November, 1911, had a fall in a bathtub, striking on the left side of the small of the back; since then has had considerable pain in the back of the left leg, which increased on walking, sitting down and getting up. He has had all kinds of treatment, has been better and worse off and on. In the spring of 1912, he hurt himself again, sliding for a base in playing baseball.

EXAMINATION, JUNE 3, 1912. Patient is a man of athletic build in good flesh and apparently excellent health. On examination the spine is found to be rigid, extension of the left hip limited. Urine examination negative.

X-RAY EXAMINATION, PLATE 572. Shows a clouded joint between the second and third lumbar. X-ray plate, showing sacro-lumbar disturbance, unfortunately is not traceable.

TREATMENT. Provisional diagnosis of spondylitis traumatica is made and a spinal brace applied. Not much change is noticed. In October consultation with Dr. Henry L. Taylor is had. He confirms the diagnosis and advises continuation of treatment. The patient is put to bed with the brace. Is comfortable while lying down, but any attempt to sit up or stand or walk renews the pain in the back of the left leg, in the form of a sciatica. In November consultation with Dr. Ridlon of Chicago confirms the diagnosis, and under his advice the patient remains in bed, wearing the brace, till October 1, 1913. At that time the patient's general health is excellent, the spine has become freely movable. The pain in the left leg, however, still persists. X-ray (plate not traceable) showed trouble at sacro-lumbar joint.

OPERATION, OCTOBER 1, 1913. A graft is inserted in the middle line of the third, fourth and fifth lumbar and first and second sacral vertebrae, another graft over the left sacro-iliac joint. After an uneventful recovery, the patient leaves the hospital at sixth week. Since that time he has been up and about, resuming work which makes extensive traveling necessary, about three months after the operation. He has had no pain or discomfort of any kind since, has been steady at his work and indulges again in light forms of games, having taken up bowling without bad results.



CASE 4. After operation.

**CASE 4.** M. A., female, 38 years, married, housewife, two children.

**HISTORY.** For about three years has had pain in the small of the back. Pain is constant, not relieved by lying down, aggravated by standing and walking. She has had various forms of treatment during that time, without result.

**EXAMINATION, MAY 4, 1913.** Patient is in apparently good health and flesh. She claims to have lost weight lately. The sacro-iliac joints and the sacro-lumbar joints are extremely painful under slight pressure. No rigidity of spine, extension and rotation of left leg limited. Urine examination negative. Bimanual reported negative by family physician.

**X-RAY EXAMINATION, PLATE 727.** Plate shows an open left sacro-iliac joint, some irregularity of sacro-lumbar joint.

**TREATMENT.** Strapping and a belt are without avail; heat and massage do not relieve the condition. The patient, under advice of counsel, is placed in a plaster cast, July 7. After two months in the cast, she resumes walking, with the return of the former symptoms. Local treatment being once more tried and yielding no improvement, operation is done.

**OPERATION, NOVEMBER 1, 1913.** The graft is inserted into the third, fourth and fifth lumbar and first and second sacral spinous processes, and another graft over the left sacro-iliac joint. The patient is in bed



CASE 5.

six weeks. Since that time she has been up and about; general improvement has been slow and tedious, more or less pain being experienced on walking. Improvement continued, however, till about six months after the operation the patient was able to resume all her duties. Since that time she has had complete relief of her symptoms and no recurrence.

**CASE 5.** E. A., female, 20 years, single, lady's maid.

**HISTORY.** For one year pain on left side of lower back, aggravated when bending and when lying down; has lost considerable weight for the last six months. Sought relief at the hands of a gynecologist, whose bimanual proving negative and medication giving no results, she is referred to me.

**EXAMINATION, JUNE, 1913.** Patient is a female in good general health and flesh. There is a marked lordosis in the lumbar region, much tenderness over both sacro-iliac joints on slight pressure. The spine is not rigid. Rotation of thighs slightly limited. Urine examination is negative, except for the presence of indican.

**X-RAY EXAMINATION, PLATE 747.** Both sacro-iliac joints seem more open than normal in the lower part. There is suggestion of a lesion in the sacrum.

**TREATMENT.** Heat, massage, strapping and a brace prove of no avail.

**OPERATION, NOVEMBER, 1913.** Graft over third, fourth and fifth lum-

bar and first and second sacral spinous processes, one over left sacro-iliac. In bed six weeks, then returned home. She has been free from pain and about since then, but her general health was indifferent for about five months after the operation, then she resumed active work, which she has continued since without recurrence.

CASE 6. J. T., female, 43 years, married, two children, housewife.

HISTORY. For a year and a half has had considerable pain in the small of the back. This pain extends down both legs, interferes with bending the back, and with moving in general. Bimanual examination negative. Usual forms of treatment without results; referred to me.

EXAMINATION, FEBRUARY 1, 1914. Patient is a female, somewhat poor in flesh and apparently in tender health. Both sacro-iliac joints are tender on pressure, the right one very prominent. The sacrum is shallow and stands practically vertical, having escaped forward. Urine examination is negative. Slightly enlarged finger joints.

X-RAY EXAMINATION, PLATE 804. Sacro-iliac joints seem open forward, in the upper part more than normal.

OPERATION, FEBRUARY 3, 1914. Graft over third, fourth and fifth lumbar and first and second sacral, one over right sacro-iliac joint. In bed six weeks; resumes walking without pain; general recovery slow, taking about two or three months. Patient now walks, has done her own housework since then. No recurrence till November, 1915, when, after some exertion, sciatic pain was experienced. The patient having an arthritic tendency, attention to diet and ichthyol internally make the attack yield readily, since which time the patient is all right.

CASE 7. F. Z., male, 30 years, laborer.

HISTORY. For some months past the patient has been suffering great pain on the left side of the lower back. This pain extends into the left leg, which is drawn up, being held in flexion. The trunk has been sinking down to the left, and the patient limps with the left leg. The patient has lost considerable weight, has for several months been unable to follow his work. Patient had an attack of sciatica about five years ago. The left leg, he says, has been longer than the right for some years back. I take it that this means that his body has been leaning over to the left for some years, giving him the impression that the left leg was longer.

EXAMINATION, DECEMBER, 1913. Patient is a stockily-built laboring man, rather poor in flesh. Stands with flexed left leg, the trunk inclined to the left, limps much on walking. The spine is rigid. The left leg resists extension. Urine examination negative.

X-RAY EXAMINATION, PLATE 803. X-ray shows distortion of fifth lumbar and upper part of the sacrum, also compression of the sacrum from the sides, the sacrum being extremely narrow.



CASE 7. After operation.

**TREATMENT.** Operation was advised, but the patient declining, strapping, a long plaster-of-Paris cast, application of heat, gave no relief whatsoever. The patient left my care dissatisfied and sought relief elsewhere, but returns January 29, 1914, his condition having become so aggravated that the pain is excruciating, and he asks for immediate operation.

**OPERATION, FEBRUARY 7, 1914.** A graft is inserted in the third, fourth and fifth lumbar and first and second sacral spinous processes, also one over the left sacro-iliac joint. The patient is kept in bed in the hospital six weeks. He had a stitch infection of the lumbo-sacral wound, which healed after two or three weeks' discharge without endangering the graft. At the end of six weeks he left the hospital, walking. He has made a somewhat slow, otherwise uneventful, recovery. He has not returned to the heavy and laborious work he did at first, but has been doing work as a yard foreman since that time. He has had no return of symptoms, gained considerable in weight.

**CASE 8.** J. D., female, 45 years, married, three children.

**HISTORY.** For twenty-two years, after the birth of the first child, has been taken with intense pain in sacro-lumbar region. This pain has been constant, but the patient has been about with it; has tried to do her housework duties. Some fifteen years ago had a severe fall, after which

the symptoms became aggravated. For the last year the intensity of the pain has increased so that she has been unable to perform any kind of work. She has had all kinds of treatment, including the application of belts, all of which have proved futile.

**EXAMINATION, JUNE 11, 1914.** Patient is a female, rather fleshy, moves with difficulty, and all signs of intense pain. The sacro-lumbar region is painful on pressure. The legs resist rotation. Urine examination negative.

**X-RAY EXAMINATION, PLATE 837.** Shows the fifth lumbar vertebra sitting obliquely on the sacrum as if sunken in on one side.

**OPERATION, JUNE 17, 1914.** Graft over the third, fourth and fifth lumbar and first and second sacral spinous processes, one over sacro-iliac. Pain left the patient as soon as the effects of the anesthetic were gone. She was up in six weeks and returned home, a distance of twenty-five miles, in an automobile. This must have shaken her up considerably, for her recovery was slow, but after some months she has experienced complete freedom from pain. Improvement has continued and allowed her to resume her usual household duties.

**CASE 9. J. W. M., male, 41 years, married, merchant.**

**HISTORY.** For the last five years has had numerous attacks of lumbago, so called, that used to yield to treatment by heat and massage, but less and less so, till now no relief is experienced. Of late the pain has extended into the right upper leg, taking the form of a sciatica. The pain is so constant and severe that the patient comes with an avowed purpose of trying operation as a last resort.

**EXAMINATION, JUNE 15, 1914.** The right sacro-iliac joint, very tender on pressure, the left less; spasms of lumbar muscles. The patient is a man rather poor in flesh. Urine examination negative.

**X-RAY EXAMINATION, PLATE 840.** The body of the fifth lumbar much diminished in size. The joints between fifth and fourth and fifth and sacrum are rough and irregular, suggesting a lesion in these joints and of the fifth lumbar vertebra.

**OPERATION, JUNE 18, 1914.** Graft over third, fourth and fifth lumbar and first and second sacral, and also one over the right sacro-iliac joint. The patient in bed six weeks, removed by automobile to his home at the end of the sixth week, a distance of about ten miles. In bed several weeks more, recovery slow but finally complete. Has resumed active work and has been free from any kind of pain or inconvenience. The patient has had one attack of sciatica five months later. Attention to diet has done away with the attack rather promptly. •

**CASE 10. A. W., male, 18 years, student.**

**HISTORY.** In good health till six months ago, when he indulged in



private theatricals, assuming there the rôle of a lame person, rehearsing strenuously for four to six weeks. He then experienced a pain in the left sacro-iliac region, which was soon followed by stiffness of the leg in walking, as well as rigidity of the back in moving. The pain increased in spite of the use of various remedies, and towards the last considerable loss of weight was experienced.

EXAMINATION, JULY 6, 1914. Patient is a young man of athletic make-up, apparently in good general health and in fair flesh. The left leg is markedly thinner than the right. Flexion of the thigh is limited, also rotation. There is some rigidity of the spine. Urine is normal.

X-RAY EXAMINATION, PLATE 847. Articulation between fourth and fifth lumbar irregular, body of fifth lumbar invisible (due to tilting or sliding forward), the left transverse process of fifth lumbar in close proximity to free part of sacrum.

OPERATION, JULY 9. Graft over third, fourth, fifth lumbar and first and second sacral and over left sacro-iliac joint. In bed six weeks, then resumes walking, making an uneventful recovery up to now. No recurrence; indulges in all activities of a young man, including dancing and skating, without inconvenience.

CASE 11. S. T. P., male, 14 years, high school pupil.

HISTORY. For several months has had severe pain in small of the back, stiffness of the lower spine which compelled him to give up school since April. Has lost weight.

EXAMINATION. Patient is a boy of good general health and flesh. There is some rigidity of the spine. The right leg resists extension. Urine examination negative.

X-RAY EXAMINATION, PLATE 849. Shows a lesion of fifth lumbar articulation on right side. Unfortunately, X-ray plate relating to the case is broken.

OPERATION, SEPTEMBER 16, 1914. A graft over the third, fourth and fifth lumbar and first and second sacral vertebrae. Patient up after six weeks; makes an uneventful recovery, returns to school. Has been well up to the present time. Indulges in activities such as become a boy of his age.

#### RÉSUMÉ OF CASES.

1. LOCATION OF LESION. In the sacrum, three (Cases 1, 2 and 7); in the sacro-lumbar, four (Cases 3, 8, 9 and 10); in the sacro-iliac, three (Cases 4, 5 and 6); in the fifth lumbar, one (Case 11).

2. PROBABLE ETIOLOGICAL FACTOR. Tubercular, four (Cases 1, 2, 7 and 11); traumatic, two (Cases 3 and 10); arthritic, four (Cases 4, 5, 6 and 9); doubtful, one (Case 8).

3. NATURE OF OPERATION. Two sacro-lumbar grafts, one (Case 1); one sacro-lumbar graft, one (Case 11); one sacro-lumbar and two sacro-iliac grafts, one (Case 2); one sacro-lumbar and one sacro-iliac graft, eight (Cases 3, 4, 5, 6, 7, 8, 9 and 10).

4. RESULT. Good, complete and rapid recovery, eight (Cases 1, 2, 3, 4, 5, 6, 10 and 11); fair, Case 7; slow but good and complete recovery, Cases 8 and 9.

5. Time elapsed from Case 1, three years and ten months; Case 11, one year, four and a half months.

#### FINAL CONCLUSIONS AS TO INDICATION FOR OPERATION.

1. The fixation of the sacrum is absolutely indicated in all cases where the usual mechanical methods of fixation, such as strapping, belts and braces, have failed to accomplish the result.

2. As the operation is practically without risk and danger, except that incident to the anesthesia, and as it shortens the time of treatment and lessens considerably the expense of treatment to the patient, it is economically indicated in all cases where no medical or surgical contraindications exist.

3. Where the lesion and distortion are plainly made out and of some degree of severity, the operation is indicated from the very first. Usually, however, the patient will be better satisfied with having the operation done after some of the other means have been tried.

4. The only contraindication to such fixation is in the case of young females, who may expect sometime in their lives to become pregnant. Delivery with fixation of the sacrum in the sacro-lumbar and sacro-iliac joints may be more difficult in all cases. No evidence of hindrance so far exists to my knowledge. However, it would seem that in a not over-roomy pelvis, such fixation would be an obstacle to uneventful delivery. In two of the female cases operated, the sacrum seemed to me to be abnormally narrow, perhaps due to compression, and the pelvis as a whole contracted. No definite measurements, however, were taken at the time. This point will have to come in for consideration in the future. However, it is my opinion that some of these cases show a contracted pelvis from the beginning, and that fixation will not increase the difficulty of delivery beyond what might have been expected anyway.

In the case of males, there is so little movement at sacro-lumbar and sacro-iliac joints, that fixation there will not interfere with industrial or other pursuits.

THE OPERATIVE PROCEDURES EMPLOYED IN THE TREATMENT OF THE RESIDUAL PARALYSIS OF POLIOMYELITIS AT THE CHILDREN'S HOSPITAL, BUFFALO, N. Y.\*

BY BERNARD BARTOW, M.D., AND WILLIAM WARD PLUMMER, M.D., BUFFALO, N. Y.

IN the past five years the city of Buffalo has been visited by two well-marked epidemics of poliomyelitis,—in 1910 and in 1912. The former did not assume the alarming proportions of the later epidemic, but there was a sudden increase of the number of cases as usually reckoned in our community, and a number of cases in the acute stage were brought into the contagious pavilion of the Children's Hospital. We were able to see these cases progress through the various stages of the disease, took part in their treatment, and in several instances the cases came up later for operative corrections. In the epidemic of 1912, there was a total of over 350 cases for the city. At that time there were no cases cared for at the contagious pavilion of the Children's Hospital, but they were cared for at the Wende Hospital for Contagious Diseases, a municipal institution, and in the homes of the patients. The writers saw a majority of these cases in the early stages, and some of them have since appeared for operative treatment.

The great majority of all of the cases of both epidemics were children of the poor, and mostly of foreign parentage. These, with the few sporadic cases of older history, not originating in any definite epidemic, have provided the bulk of the poliomyelitis material seen at the Children's Hospital since 1910. It was about that time that the policy of the orthopedic service became crystallized, as it were, with the purpose of, carrying out, as far as possible, a plan of operative treatment in the care of poliomyelitis cases. The conditions under which we worked seemed to be better met by such a plan. For the many details necessary to the proper administration of a conservative plan of treatment, we were obliged to depend upon ignorant or unwilling parents, as neither our hospital nor our social service facilities were adequate to assume entire control of the cases. For this reason, in part at least, most of our cases have been operative, and operative earlier in the history of the disease, perhaps, than has been the practice in many clinics.

For another reason have we favored operative treatment. It has long been recognized that, of all the measures at our command for salvage of the wreck left by poliomyelitis, exercise and training of weakened and deficient muscles has been one of the most potent factors in

\* Read at the Annual Meeting of the American Orthopedic Association, Detroit, May 7, 1915.

the return to some semblance of a normal function of the part involved. Specialized exercise treatment being apparently impossible of accomplishment, we have planned our work to allow as much as possible free use of the extremities involved, making our chief aim the prevention and correction of deformities and depending upon the stimulus of use for the restoration of function. With two or three exceptions, no brace or similar apparatus has been used, the only mechanical appliances being in the form of modified shoes used to help maintain proper foot postures. None of the cases, with one exception, have been operated upon until at least a year has elapsed since the onset of the disease. In the single instance noted, the elapsed time was six months.

The brief report following includes a résumé of 152 joints operated, and describes the cases as improved, or not improved. In many instances the results are probably permanent, but, in view of the fact of the possibility of changing muscle conditions, are not so recorded. The general plan has included the use of artificial ligaments, tendon transpositions and fixations, combined with such relief of contractures and correction of bone deformities as the individual case indicated. Osteotomy for the correction of knock-knees has been the most frequent bone operation, remodeling of the tarsal bones being necessary in only a few of the foot cases. No attempts at arthrodesis have been made except in a small number of flail hips.

It has been of interest to note in many of the cases the increase of power in deficient muscle groups incident to the free use permitted, and in some instances where the silk ligament has been the original procedure the improved muscle condition following has led to secondary tendon transpositions with very satisfactory results.

The 152 cases reported in this series are divided among the joints, in order of frequency of incidence, as follows: ankle, 77; knees, 44; hips, 17; shoulders, 11; elbow, wrist and spine, each 1.

**ANKLE.** In the series, 77 joints, valgus drop foot was the predominating condition; varus and calcaneus a lesser number. In this region remodeling bone operations were done in 5 of the cases. Silk ligaments were used alone 38 times and tendon transpositions, alone or in combination, 34 times. Tendon fixations after the manner of Gallie were used in 7 of the cases. All the cases were protected in plaster for at least three months and the worst cases from five to seven. Modified shoes in all cases, but no other apparatus. Sixty-five of the cases are recorded as improved. Of the 12 not improved, one was a tendon transposition and 11 were silk ligaments in which the condition relapsed. The latter were all valgus cases, subject to secondary operations. In this series it

has been found necessary to remove the silk from 4 joints; one ten days after insertion because of acute infection, the only infected silk case in our entire experience. Two silks were removed in the same individual after six and twelve months, both feet having been operated. Reason for removal: small cysts over knot at point of fastening. The silk strands were found quite complete as inserted, and there was sufficient connective tissue about the silks in the joints to prevent relapse of the valgus. The fourth removal was in a valgus, in which contraction of the proliferation tissue produced a varus, which was corrected by section of the scar and withdrawal of silk. In the improved cases it has been interesting to note the increase of foot control through improved power in the accessory muscles, particularly the toe extensors.

**KNEE.** In the flail-knee cases there were 44 joints operated. With the exception of one case in which a transposition of the hamstrings to the quadriceps was done, they were all treated by a double anterior insertion of the silk ligaments, as described in previous papers by the writers. In 14 of the joints a knock-knee was corrected by osteotomy above or below the knee, and in two, silks were passed behind the joint to act as a check against a back knee posture. The joints were all placed in plaster for from 5 to 7 months, and in a few of the relapsed cases a semi-flexible leather cuff has been worn. One silk was removed eight months after operation because of a cyst over the knot, and there were no infections. It is interesting to note that in one case, a boy eight years old, an injury of the operated knee, sustained nearly two years after the operation, produced, not a rupture of the artificial ligaments, but a separation of the lower femoral epiphysis. This was reduced, and the knee is apparently as it was previous to the accident. Where there have been contractions causing flexion deformities, these have been released before inserting the silk. Of the series of 44 joints, 35 have been recorded as improved. Nine have showed relapse, some of them only in part, to the original flail condition. Four have been well controlled by the leather cuff previously mentioned.

**HIPS.** In this series 17 cases were operated upon. The conditions presented were paralytic dislocations, complete flail joints, external rotation due to paralysis of the inner rotators, and contractions of the thigh flexors. Four flail joints were treated by arthrodesis and a bone flap procedure. Two cases were failures and two gave good results. One was treated by bone graft across the joint; result not yet recorded. In two cases of luxation, the hip was reduced and a crescentic section of the great trochanter grafted into the pelvic wall at the upper edge of the acetabulum. Both these cases have now a good anchorage, the head

lying above the normal level, but without tendency to a backward position. Three of the cases with external rotation were treated by inserting silk into the anterior spine of the ilium and great trochanter, thus limiting external rotation, and are recorded as improved. A fourth case so treated did not give a good result. Two flail hips were treated by the insertion of silk ligaments directly into the joint by means of a recently devised technic, and are not recorded here. The cases of contractures of the thigh flexors have been improved by suitable myotomies, etc. Of the 7 flail joints operated upon, there have been 4 good results and 3 failures.

**SHOULDERS.** The shoulder cases operated upon number 11 and were selected because of a useful hand and forearm. These cases all showed relaxed and loosened shoulder joints, with the humeral head in a lowered position and very movable. All of them had some control of the scapula, although in none was there any abduction power. These cases were all treated by the insertion of silk ligaments from acromion to humeral head, to give the humerus a better fulcrum in the joint. The result is that the joint is more stable and any movement of the scapula is more readily transmitted to the arm, producing a sort of spurious abduction. All of these cases have shown improvement in efficiency of hand and forearm as the result of the greater possible range of movement. It is interesting to note that, of all the joints in which the silk has been inserted, the shoulder has shown the most uniform and consistent improvement of function.

Of the elbow and wrist, one case each has been operated upon. Both were flail joints, and an attempt was made by the insertion of silk ligaments to produce a partial fixation. The result was a failure in both instances.

One case of paralytic spinal deviation has been treated by operation. In this instance a transplant of bone from the tibia was made into the spine, after the manner of the Albee method for ankylosing the spine in Pott's disease. The tibial transplant included the processes of seven vertebrae and was bent in on the concave side of the curve and fastened in the usual way. The case was then supported in a plaster jacket. The graft has healed in without trouble, but the elapsed time since the operation is too short to record the result here.

In conclusion: It would seem that, all things considered, the general plan of operative treatment of these cases has worked out on a fairly efficient basis. The majority of the cases have shown improvement, and while many have required secondary operations, most of these have been reoperated because of the development under use of power in muscles

primarily showing very deficient or apparently absent function. In going over the series it will be noted that all of the available surgical methods have been used with due consideration for the existing conditions in a given joint, at the same time attempting to carry out a plan which would minimize the necessity for apparatus and permit of the free use of the extremities without depending upon daily intelligent supervision. While, without doubt, many of the results are not permanently good, at least it is the belief of the writers that these cases have been brought through a considerable part of their post-paralytic history without the handicap of the extreme disablements and deformities so often noted as sequelae of poliomyelitis.

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### SHORTENING LONG LEGS AND LENGTHENING SHORT LEGS: A NEW SURGICAL PROCEDURE.

BY R. TUNSTALL TAYLOR, M.D., BALTIMORE,

Orthopedic Surgeon to the University, Kernan, Women's, St. Agnes' and St. Joseph's Hospitals.

As a preliminary report of these operations, the writer wishes to say that, from time to time, orthopedic cases present themselves at our clinics showing an extreme degree of shortening in one leg, incident to neglect in their early treatment or the result of severe disease, and are conspicuous, for one reason or another, the usual methods of equalizing the asymmetry being unavailable or objected to.

The unsightliness of the iron patten, the high cork or wooden-soled shoe, and the "extension shoe," that vicious mechanical device that throws the foot into extreme equinus and excoriates the heel cord by its retaining strap,—all present difficulties. To the poor the cost of these appliances is an obstacle; and to the poor and rich alike, the conspicuousness of such apparatus for life is a cause of self-consciousness, embarrassment, sensitiveness and mortification.

Such cases are chiefly the result of tuberculosis of the hip or knee joints, fractures or infantile paralysis, but most often we see those that are the result of the first named.

We, of course, in these can help somewhat by Gant's subtrochanteric osteotomy for flexed and adducted thighs, when ankylosis has deformed them and made the apparent shortening greater than the real shortening. It is to be taken for granted, however, in this paper, that we are dealing with real shortening alone, appropriate operations having been done to

overcome flexion and adduction at the hip and flexion of the knee, and that we are dealing with straight and parallel legs in which there is at least a real difference in length of three or more centimetres.

Accordingly, the writer began to endeavor to thrash out a way and means, with the equipment we now possess for plastic bone operations, to equalize this disproportion. We are all familiar clinically with museum specimens of mal-union in fractures, especially in the femora, where there is a marked overlapping of fragments and in which the soft parts have readily adapted themselves to the new order of things.

*First*, then, instead of the accidental and unscientific lateral over-riding of fragments, if segments of bone the desired length are resected and the fragments are brought end to end by appropriate shaping, why should not the desired result be accomplished?

*Further*, vice versa, and *secondly*, if it be desired to lengthen one leg, why should it not be possible by suitable cutting of fragments and mortising after traction, to pull the leg out the desired length, within limits? Should not a gain be thus made? Both procedures are practical. The difficulties and the working out of a technique in the study of the two problems will be described as follows:

Experiments on the dog in shortening bones successfully were done at the Kernan Hospital, and Dr. J. Holmes Smith, Professor of Anatomy in the Medical Department of the University of Maryland and College of Physicians and Surgeons, kindly put at the writer's disposal three undissected cadavera, for experimental purposes, with the skin intact, and in which the vessels had been injected.

Briefly, after various regions and sites had been tried, an external incision was determined on, at the middle third of the bone for both procedures. At the upper third the thickness of the muscles and fat rendered work on the bone difficult or inaccessible, and operative procedures at the lower third brought one so close to the popliteal vein and artery, which there hugs and even in certain cases grooves the bone, that bone section will be possibly unsafe or hazardous. At the middle third, it may be necessary at times to ligate the nutrient artery and vein, but collateral circulation will care for this and, with a well exposed field of operation, these vessels may be avoided, leaving them with the upper fragment.

An incision 15 to 20 cm. was found necessary in the skin of the external aspect and in the long axis of the thigh, the length dependent on the thickness of the muscles. Free incision of the ileo-tibial fascia was made lengthwise, and by transverse section of it the fibres of the vastus externus were freely exposed, which by blunt dissection and retractors



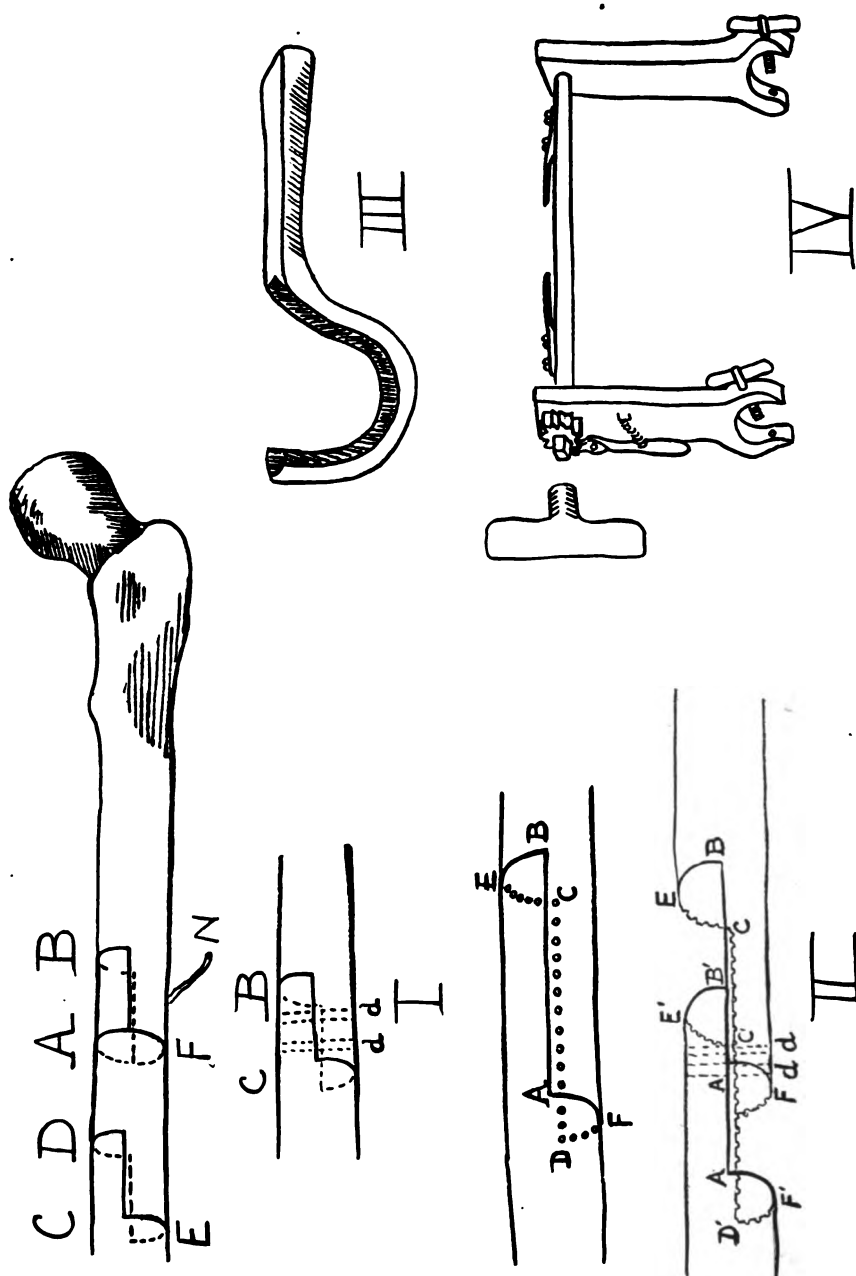


FIG. I. Lines of section in bone shortening.  
 FIG. II. Lines of section in bone lengthening.  
 FIG. III. Stick-shaped grooved director for carrying Gigli saw around bone.  
 FIG. IV. Traction apparatus used on Bradford frame for bone lengthening.

could be separated down to the bone, which was readily freed of muscular attachment except at the *linea aspera*, and here one must be careful of the nutrient vessels, and free the muscles above and below them only by cutting.

Owing to the depth of the wound, it was found impractical and unsafe to cut the bone transversely with the circular electric saw or any straight hand saw, for fear of injury to the femoral vessels or other soft parts on the medial aspect, so a special grooved director, shaped like a sickle with the groove on the concavity to carry a Gigli saw, was made for us by the instrument-maker. This instrument, passed under and around the bone, rendered cross section easy, as well as acting as an excellent retractor of the muscles.

After removal of the length of bone determined on, various methods of re-uniting by fixation were experimented with. The Lane plate in this region clinically causes less trouble than elsewhere, but preferring the use of bone, intra-medullary pegs, bone inserts in the cortex and bone pegs through and through as dowels were employed, driven in from the front, the last named being finally decided on as the most secure after the bone ends had been mortised with the upper fragment posterior to offset the pull of the *psoas* and affording closer approximation. The dowels were made from a tibial graft. After section and removing the desired amount, the ends can quickly be shaped for mortising, when brought out of the wound, with the circular electric saw.

Technically, this operation of shortening presents no serious difficulties. In practice, the patient must be willing to have the reduction in height, anxious for an equalization of the legs in length, and sufficiently cognizant of the danger and trustful of the surgeon to "submit the good leg to the risk."

The second procedure, or that of lengthening the femur, is more difficult, but can be accomplished with little or no post-operative pain from muscle spasm, even when myotomy and tenotomy are not done, but it is preferable to divide the adductors, ileo-tibial band and hamstrings freely to facilitate lengthening after the bone is shaped for mortising.

The writer feels this operation should be done in two sittings, four or five days apart. At the first, the tendons and muscles are cut, and the dowels are made from the tibial crest and kept in sterile salt solution on ice. At the second sitting, the incision described is made in the thigh and the fibres of the *vastus* separated to the bone, as in the shortening operation. With the circular electric saw a linear incision is made in the long axis of the bone on the outer side of the desired length, *i.e.*, at least 2 centimetres longer than it is desired to lengthen the limb.

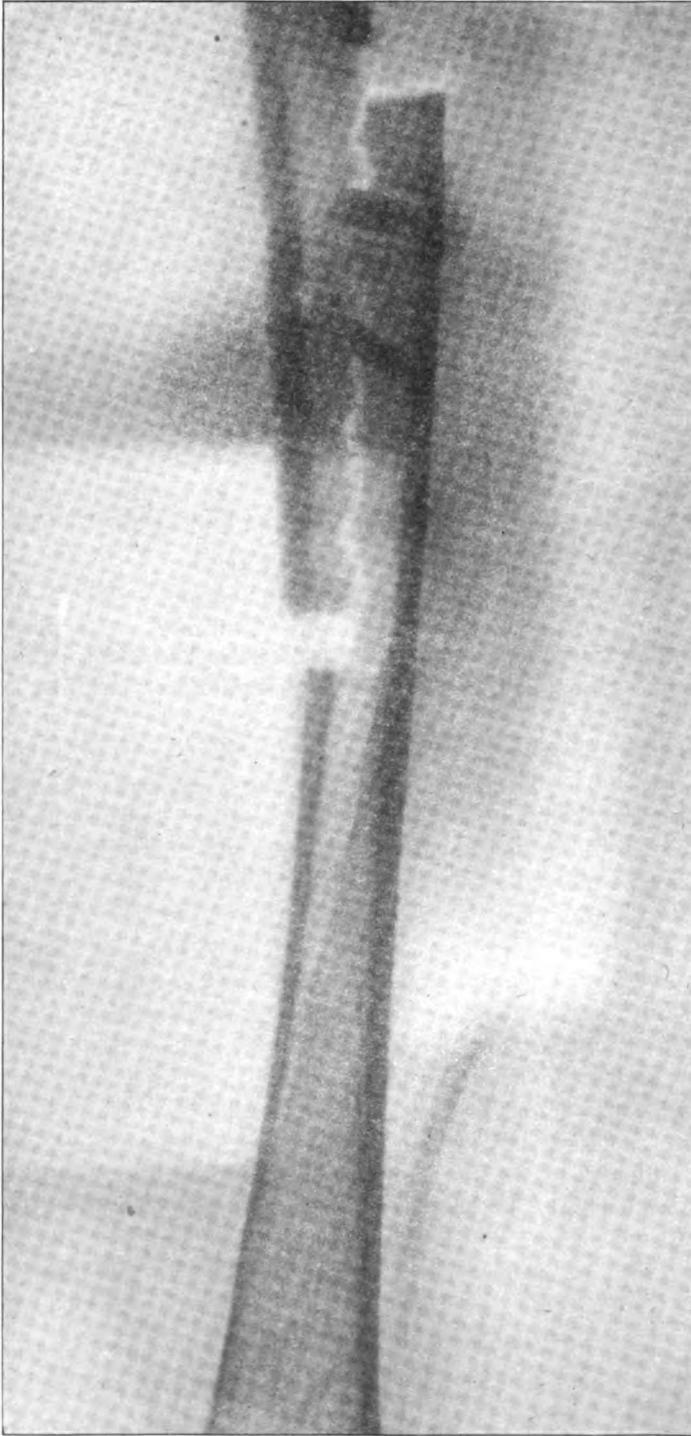
With a thin rounded- or guarded-end hand-saw, a half section is made on the anterior aspect of the bone down to the upper end of the longitudinal incision. Similarly, a half section is made on the posterior aspect of the bone up to the longitudinal incision at the lower end. The sickle-shaped, grooved director and retractor acts as a safeguard in these procedures. Next a nickel-plated spatula is passed around the bone on the inner side to protect the vessels, while a small electric drill cuts the cortex at intervals through on the inner side of the bone by passing it from the outside longitudinal incision through the medullary cavity to the cortex beyond. The nicked spatula will enable the assistant to see when the inner cortex is punctured. With a series of these holes, it is then easy, with a small, thin osteotome, to cause separation of the two halves of the mortise without any splintering or cracking of the bone in an undesired direction.

Prior to operation, from the knee down, the patient has had applied swansdown adhesive traction straps and webbing, is supplied and fixed with double perineal straps on a Bradford bed frame on the operating-table. At the bottom of the Bradford bed frame is a windlass attachment for the reception of the webbing traction straps. By means of the key on the windlass the desired degree of traction is made, and with an electric drill holes are now made opposite each other for the dowels in the drawn-apart lengthened bone. Two dowels are inserted and hold the bone fragments in perfect apposition, while the soft parts are sutured without drainage, and the cast is applied from the toes up to and over the costal margin as a long spica, the extension straps having been removed. Preferably the Hawley fracture table can be used.

Only one case of lengthening has been done by the writer so far, and with no untoward symptoms, showing that the procedure is safe and possible.

This patient, E. S., a girl, aged fifteen, had tubercular coxalgia in early childhood without proper care and treatment, which resulted in noticeable real shortening. As a result of the lengthening operation, 2 centimetres were gained in length without division of the tense tendons and muscles; and in subsequent operations, the writer feels much more can be gained by such preliminary procedures, plus the use of the Hawley table. There was no elevation of temperature nor pain after this operation, as one would expect from muscle spasm.

Neither of these operations, nor similar operations, has been done, so far as the writer has been able to find in the literature, and he was under the impression the idea was entirely original and had not been suggested previously. On preparing this paper, however, he finds that



Showing lengthened bone and bone pegs.

in 1907, Dr. Robert W. Johnson (Transactions of American Surgical Association, Vol. xxv, p. 40) presented a paper entitled "Resection of the Sound Femur in Gigantism and Asymmetry," his plea being more in behalf of long-legged girls, than for the crippled. He says: "No doubt most of you have observed that a woman over six feet in height is more or less an afflicted woman. She may enjoy perfect health and yet have not the same chance for average happiness as her sister of five feet seven or even ten inches. In society she is more or less gawky, more or less handicapped by her height and shunned by the average man, who hates to be looked down on.

"When she dances she towers over most of her partners and is a living picture of the caricatures of Thackeray or Du Maurier or Gibson. She endeavors to meet this misfortune by stooping to conquer. Her shoulders fall and her neck cranes out. She recognizes that she is ostracized by her friends, 'beaten by a neck,' until finally she settles down with a five-foot-three husband, if any, who has not sense enough to see how ridiculous they will appear together for the rest of their pilgrimage.

"To put it mathematically, such a woman's chance for happiness is inversely in proportion to the distance from her trochanters to her external condyle."

Dr. John B. Roberts, in discussing Dr. Johnson's paper, said he was much interested, as he had advised a young army cadet who had one leg longer than the other, as the result of fracture, and was liable to be discharged, to allow him to do a resection, but thus far the operation had not been done.

Dr. Paul B. Magnuson in 1913, following some experimental work on dogs and the use of ivory screws with detachable brass heads, suggested a mortise method of lengthening bones. (*Surgery, Gynecology and Obstetrics*, Vol. xvii, p. 63.) He suggests an incision beginning at the middle of the inner aspect of the thigh between the vastus internus and adductors and down to the condyles. Bone section here at thirty degrees with the antero-posterior plane would be best, according to Magnuson, "offering less muscular resistance to lengthening, as all the muscles attached to the upper fragment go to the pelvis and all the lower muscles on the lower fragment go to the leg." He does not report, however, ever having done a case.

In our preliminary experimental work on dogs, in the studies on the cadavera and in the operation on the patient, the writer wishes to acknowledge the hearty coöperation of his assistant, Dr. C. Reid Edwards.

## DISCUSSION.

DR. SAYRE: I think it might interest Dr. Taylor to quote on this occasion the description of an operation that was done in New York in the year 1863 on a boy 10 years of age. I remember hearing my father speak of the fact that the boy had the limb shortened to match the other.

## PARTIAL EXSECTION OF THE FEMUR ON BOTH SIDES.

DR. A. C. POST exhibited a boy between ten and eleven years of age, on whom he had performed the partial exsection of the femur on both sides, Dr. Sayre being present. He said: "This boy was the subject of morbus coxarius in both thighs. It is now about two years since I excised part of the bone on the left side, which was in a state of necrosis and caries. Suppuration commenced in the other limb, and was very obstinate. This limb being two or three inches longer than the other, about five months ago I operated on the right thigh to bring the limbs into a state of parallelism. I have frequently made deep incisions into the bone. (The Doctor here exhibited the pieces of bone removed.) For two or three months after the last operation, a discharge continued. The hip is very much better; he is able to stand upright, and can move rapidly on his crutches. He has considerable motion of the left hip joint, but the right is ankylosed with the pelvis. He is able to sit down only in a very imperfect way; has recently begun to go to school; of late years he has been at home on account of his health. He has only begun to walk within the last fortnight.

DR. HUNKIN: The procedure advocated by Dr. Taylor is not new, similar operations having been done by me many times. Two cases in point are the following: July 19, 1909, a young man came under observation with a useless left hand completely dislocated to the radial side. When a young boy he had a compound fracture of the lower end of the radius, with, as near as could be learned, a simple fracture of the ulna. After some time, healing not taking place, the lower extremity of the radius was removed. At the time observed, there was no evidence of any change in the ulna, but the lower end of the radius was drawn out to a fine point, and was five inches shorter than the ulna. In this case  $2\frac{1}{2}$  inches was cut out of the ulna towards its lower end. It was not freed entirely from the soft tissues on the interosseous border, but was rotated upon that border to the radial side and wired into place; the ulnar ends brought together and also wired. The radius healed promptly, while no union occurred in the ulna, and on June 2, 1910, the ends of the ulna were freshened and a plate applied. Union occurred, with a functioning hand in alignment with the arm. A message from the father during the last few weeks tells me the son has a very good hand.

In another case of a 2-inch shortening of the femur, during the same months, the young man wanting to go to West Point, 2 inches were removed from the other femur. The man is now an officer on the border, so it is evident the disparity was removed.

DR. EIKENBARY: Along the line of the operation as suggested by Dr. Taylor for the lengthening of short legs, I should like to report the work of Dr. Fred Fassett, of Seattle. In several instances Dr. Fassett has made four longitudinal incisions into the femur, then divided the continuity of the bone, very much as one does for a plastic operation of a tendon, the leg then

being stretched to the maximum, and the resultant space filled in with freshly prepared bone or magnesium. By this process the continuity of the bone is not lost, nor is it necessary to anchor the bone by means of any foreign matter.

DR. RYERSON: Unless we can get a very appreciable lengthening by this operation, it seems to me rather severe, and as described by Dr. Taylor, the lengthening obtained is so small that I should not feel justified in subjecting a patient to the operation.

Dr. P. B. Magnuson of Chicago some years ago wrote an article which described the operation in practically the same details as you have heard from Dr. Taylor. He believed that two inches of lengthening could easily and safely be obtained. I asked him to operate for me upon a boy with a congenital shortness of the femur. The operation was readily and excellently performed, but the boy died of shock and acetoneemia.

I have a patient, a woman of 35 or 40, who has a shortening of the femur amounting to five inches. She had had tuberculosis of the hip in childhood, with dislocation and upward displacement of the femur, with the head and neck of the femur ankylosed just above the acetabulum. Lorenz operated upon her in 1902 at St. Luke's Hospital. A fracture was made just below the trochanter and a false joint resulted, with the shaft of the femur resting against the old head and neck. This woman walks well and has a painless and freely movable joint, but the shortening is so great that she is anxious to have something done. A few years ago she fell from a street car and sustained an oblique fracture through the middle of the femur. By means of a traction of thirty pounds, maintained for four weeks, with Buck's extension, I succeeded in lengthening her femur three-quarters of an inch. Her present shortening is five inches. She is anxious to submit to any form of operation which I may advise. It would be possible, without doubt, to make a step-like division of the femur by the use of a saw, lengthening the leg perhaps two inches and removing from the other femur a section of bone corresponding in shape and size to the gap in the short femur, and securing this in place with bone or ivory screws. Whether or not so severe an operation would be justified in this individual case is a matter of opinion. I have not as yet been willing to advise this operation.

DR. FREIBERG: Bones have been shortened, though not for cosmetic reasons, especially for ischemic contractions of the fingers. The radius and ulna have been shortened. As regards lengthening limbs, Codivilla described lengthening of the extremity by a method which was the first application of a steel pin through the bone. This was driven through the os calcis. It requires simple apparatus, but a complicated plaster-of-Paris dressing. I doubt very much if it would be feasible to accomplish five inches of shortening or lengthening, but a great deal can be accomplished by this operation.

DR. TAYLOR: I am obliged to Drs. Sayre, Ryerson and Hunkin for informing me that this has been done previously. In regard to Dr. Ryerson's statement as to the degree of gain, we feel that an inch can be gained without appreciable pull, but we have been going very cautiously and feeling our way, and in the first cases we did not wish to overdo it. If the muscles and tendons are good we feel we can get two inches.

## FATAL HEMORRHAGE IN BONE TUBERCULOSIS. CASE REPORT AND AUTOPSY.

BY ROBERT C. PATERSON, M.D., SARANAC LAKE, N. Y.

WHILE hemorrhage is a frequent and not rarely a fatal complication of pulmonary tuberculosis, it is extremely infrequent, if not unknown, in tuberculosis of the locomotor system. This may be explained by the great vascularity of the lungs, as compared with the bones, and also by the more benign course which osseous tuberculosis usually follows.

Hemorrhage in any form of tuberculosis is caused by a spread of the tuberculous process through the wall of a patent blood vessel. In the tissue surrounding a growing tubercle, there is usually a zone of collateral inflammation of greater or less extent, and in this zone the circulation of the blood vessels is frequently shut off by a thickening of the walls due to an endarteritis, a periarteritis or by thrombosis. Thus, in the majority of cases, by the time the necrotic process has spread to the vessels in the tissue surrounding the original tubercle, these vessels are no longer patent or their walls are so thickened that the danger of hemorrhage is lessened. Were it not for this fact hemorrhage would occur in every case of tuberculosis.

By considering the anatomy of the bones and their vascular supply, the reason for the infrequency of hemorrhage in the bone itself will be apparent. The arteries in the bones do not form arterial anastomoses. They are end arteries. There is, therefore, no danger of a reflux hemorrhage. Again, the bone is a resistant tissue, and an inflammatory exudate, such as occurs in the zone of collateral inflammation, will close the vessels by pressure. Once the process has reached the stage of pus formation and the pus has broken through the periosteum and into the surrounding soft parts, where the large vessels are found, we have largely a mechanical problem to consider. The collection of tuberculous pus now burrows along the line of least resistance, separating muscles and extending under the fascia or along the sheaths of the neighboring vessels until it points beneath the skin, where it breaks through of itself, forming a sinus, or is opened by artificial means. The pressure and tendency to spread is in this way, not against the vessel walls and into the vessels, but rather parallel to them or towards the surface of the body.

In the case here reported, the tuberculous process extended probably into the internal mammary vessels, causing the fatal hemorrhage. The mechanical difficulties of obtaining drainage of the pus—the patient



being forced to lie on his back owing to the multiplicity and sites of his lesions—kept a quantity of bacillus-laden pus almost continually in the recesses of the various sinuses and as a result there occurred an extension in the walls and finally into the vessels.

#### CASE REPORT.

E.P., male, aged 44 years.

**PAST HISTORY.** Whooping cough as a child. Otherwise always healthy and accustomed to athletic exercise. Married 18 years. Has one child, which is healthy.

**PRESENT ILLNESS.** During the summer of 1913 there was noted a sensation of pressure beneath the sternum, with some dyspnea. This was accompanied by fever of irregular type, occasionally reaching 102 degrees. In August an abscess was opened in the second intercostal space at the right sternal margin, and this continued to discharge ever since. In the autumn of the same year the glands in both axillae became enlarged and were excised. At the same time a portion of the sternum and the second costal cartilage on the right side were removed. A little later the right wrist showed evidences of tuberculosis. The second metacarpal bone of the left hand was next involved and excised. In February, 1914, the left inguinal glands became diseased and broke down, leaving several sinuses. The left epitrochlear gland and then the right epitrochlear became involved. Toward the end of the year 1914 the left knee became painful and enlarged and shortly after the left foot became diseased.

**PRESENT CONDITION,** June 23d, 1915.

**Glandular System.** Scars of old sinuses or operations in the right supraclavicular fossa, both axillae, over both epitrochlear glands. Enlarged glands in the right side of the neck and right groin. Several discharging sinuses in the left groin.

**Osseous System.** Over the dorsum of the right hand there is a fluctuating swelling. The particular bone involved could not be determined. Right elbow shows limitation of movement, pain and tenderness and some swelling. Left hand: the second metacarpal bone has been removed, leaving sinuses both in front and behind, which are still discharging. Sternum: a portion of the sternum at the junction of the manubrium and gladiolus on the right of the mid-line has been removed. There is a sinus over this spot which discharges large amounts of thick pus. The second right costal cartilage has also been removed. The left knee is acutely painful, swollen, fluctuating, and shows the classical symptoms of tuberculous disease. Left foot: there is a large fluctuating swelling over the dorsum of the foot. Over the inner surface of the head of the right tibia there is a small fluctuating swelling.

Tubercle bacilli were repeatedly found in the pus from the various abscesses. The lungs are extensively involved. Treatment was directed chiefly to relieving the symptoms in the left knee and to dressing the various discharging sinuses. On July 31 there was some bleeding from the sinus in the sternum. This occurred again early the following morning and at 10 a.m. there was a profuse hemorrhage which was uncontrollable. Death occurred at 3 p.m. the same day.

**AUTOPSY.** August 1, 1915. Dr. A. K. Krause. Partial autopsy only allowed. Opposite the lower border of the junction of the second costal cartilage with the sternum, right side and 1 cm. to the right of the mid-sternal line, there is an opening, apparently that of a fistula, 1 cm. in diameter, through which clotted blood exudes. This is apparently the source of the fatal hemorrhage and is the only opening noted on the anterior chest wall. The sternum, with ribs attached, was removed by cutting along the costo-chondral articulations on the left side, while on the right side the ribs were cut away at an average distance of from 15-18 cm. from the mid-sternal line, thus taking in apparently all the involved area, so far as could be appreciated without further dissection. The heart and lungs were removed from the thorax, together with this breast plate, without cutting through the anterior mediastinum. The whole specimen was hardened in formalin and on the following day was carefully dissected. A linear piece of the sternum, measuring 14 x 1 to 2 cm., was chiselled out along the mid-line from the suprasternal notch to a point opposite the articulation of the third rib. The fascia over the whole right side was carefully removed; part of the second rib was also removed. This latter was found to be necrotic. It was then seen that two separate areas of necrosis and suppuration involved the right side; these two areas were separated by the third rib and extended laterally to the side of the specimen. The most striking difference between these two areas is that the one above the third rib shows a condition of much more destruction of bone, cartilage and soft parts. It is burrowing irregularly by channels running in every direction, and all these channels are filled with clotted blood. Below the third rib, however, the process is seen to be one mainly of suppuration, with pus confined between the superficial fascia and the underlying tissue in the intercostal spaces. Destruction of bone is not marked here, although here and there the ribs show eroded edges. No hemorrhage is to be noted. This area extends to the sixth rib.

Area above the third rib: probes introduced into the external opening take various directions, according as they slip into different sinuses which communicate with this opening. After dissection of the space is complete, it is noted that probes may be passed in a great many different directions if introduced into the sinuses that are present in the intercostal spaces and some pass into the medulla of the sternum. One probe passes behind the sternum to the left and upwards, and comes out on

the posterior surface of the breast plate just to the left of the midsternal line and into the left pleural cavity between the first and second ribs. It is doubtful whether there was a complete rupture originally through the pleura, although the tissue is all but eaten through. Careful examination of the anterior aspect of this hemorrhagic abscess cavity fails to reveal the source of the hemorrhage. The examination of the posterior aspect was then made. The right internal mammary artery was picked up and probed through the entire length of the specimen. Other small vessels, as well as the large veins attached to the specimen, were probed, but no ruptured vessel wall was found. The vessels in most close relationship with the abscess cavity are the right internal mammary.

Area below the third rib. The abscess here has an irregular conformation and burrows between the anterior and posterior fasciae by which it is confined, in places appearing in front of and behind the ribs.

Examination of the remainder of the surface of the body merely confirms the clinical findings as regards the location of the various lesions. The lungs are studded with miliary tubercles.

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## Book Reviews

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*The Treatment of Infantile Paralysis.* ROBERT W. LOVETT. pp. 160 with 113 illustrations. Philadelphia: P. Blakiston's Son and Company. 1916.

At the present time it is often necessary to recommend literature that deals with infantile paralysis, and this monograph of Dr. Lovett's is well worth recommending because the subject is presented in a very clear, practical way. The book is written with the purpose of summarizing the present-day knowledge in regard to this disease, and naturally it will soon have to be revised, because of the constantly changing conditions. But as it stands today it is a very good summing up of our knowledge of this disease.

The author's experience with the epidemic that prevailed in Vermont has given him a chance to study and obtain information concerning the early stages of this disease, and therefore quite an important portion, and probably the best-presented portion, is that which deals with the treatment of the early stages. He has laid a good deal of emphasis on muscle-training and exercise, which feature of treatment has not been brought out to any great extent in the current literature. As a rule the main emphasis in orthopedic text-books has been placed on the op-

erative side of the treatment, whereas we know that a properly treated case should not necessarily come to operation.

Chapter 6, consisting of 30 pages, mostly fine type, is devoted to the question of muscle-training. Unusual stress is laid upon this part of treatment, and evidently reflects the author's opinion of its value in the recovery of paralyzed muscles. Numerous illustrations help to make clear the rather technical description of exercises.

In the question of treatment during the first year of the disease we are glad to note that the use of electricity has been given its proper place, that is, one of condemnation. The evidence is against the use of electricity, and too much dependence has been placed upon its therapeutic use.

There is no attempt made to present very fully the operative side of the treatment, neither has the author dealt with results obtained by operation. Twenty-two pages are devoted to a short description of the various methods, and this feature has been kept in the background.

There is a fairly complete bibliography.

*A Clinical Study of Acute Poliomyelitis.* PEABODY, DRAPER, AND DOCHEZ. Monographs of the Rockefeller Institute for Medical Research, No. 4, 1912.

The reason for reviewing a book published four years ago is to call attention to the fact that in this monograph we have about the best presentation of our present-day knowledge of infantile paralysis. Then, too, this book, because it is not put forth in the usual channels and advertised, may have been overlooked by many.

The first portion of the book gives a very good description of the literature which concerns the acute stage of the disease, the question of epidemics and contagion, and gives a fairly complete bibliography, so that it would make a good starting point in the study of literature. It also gives a clear description of the experimental work that has been done.

Then follows a very careful and complete clinical study, which was based on 183 cases that were in the hospital during the epidemic of 1911. There is a careful analysis of the different types of cases, those showing spinal paralysis, the bulbar type, those resembling Landry's paralysis, cerebral type and abortive cases. Then there follows a careful technical description of the examination of the blood and spinal fluid. The last part is devoted to a report of the clinical histories of 32 cases.

This book does not take up any of the orthopedic problems, but it is the most complete exposition of the medical side of the subject and presents what is known about infantile paralysis up to the present time. We shall look forward to the publication of the work of the Rockefeller Institute based on the present epidemic in New York City.

*Diagnosis and Treatment of Surgical Diseases of the Spinal Cord and Its Membranes.* CHARLES A. ELSBERG, Professor of Clinical Surgery at the New York University and Bellevue Hospital Medical School. Octavo of 330 pages, with 158 illustrations. Philadelphia and London: W. B. Saunders Company. 1916.

There is an intimate connection between the fields of neurology, surgery, and orthopedics in their relation to diagnosis of spinal lesions, and it is very essential that orthopedists should have a working knowledge of the other specialties. For such a reason we are very glad to review this work of Dr. Elsberg, a surgeon who is specially attracted to the surgery of the spinal cord.

The book is divided into three parts. Part 1 deals with Anatomy and Physiology, Symptoms and Examination. This section lays a good foundation for the rest of the book, and is more clearly presented than is often found in the text-books on Nervous Diseases.

Part 2 deals with the Surgical Technic, and most of it is a description of the technic of laminectomy. It is thoroughly illustrated, and each individual step is shown by drawings and photographs. This portion is valuable on account of its detail.

Part 3 takes up the various surgical diseases of the cord. Of these the more important are the chapters devoted to fracture of the spine and the method of treatment, and to tumors of the cord. The author takes a very conservative stand in regard to fracture, but shows the possibilities of laminectomy in this condition.

The book is well worth reading by those interested in Orthopedic Surgery.

*Orthopédie de Guerre (et Physiothérapie), Appareils-Fractures.*  
F. CALOT. Paris: A. Maloine.

Calot is probably best known in this country for his advocacy of the use of plaster of Paris in Orthopedics, and especially for the so-called "Calot-Jacket" in the treatment of tuberculosis of the spine. Evidently the material that has accumulated on account of the war has prompted the publication of this book of 274 pages, devoted chiefly to the use of plaster of Paris in the treatment of gunshot wounds of the extremities.

The American orthopedic surgeons who have seen service abroad during the present war have also returned with enthusiasm for the possibilities of so-called orthopedic care in the management of wounds of the bones and joints, and it is evident that the scope of the specialty has increased to a great extent.

The book is full of illustrations, rather crude, but good enough to illustrate.

# Editorial

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## CLASSIFICATION OF ORTHOPEDIC LITERATURE.

THERE has been a definite demand for a method of classification of orthopedic literature which would be inclusive enough to permit of the proper filing of all the literature on the subject. This has led to the appointment of a committee by the American Orthopedic Association, at the Annual Meeting in May, 1916, to consider the subject and to present such a classification. The JOURNAL is presenting below a temporary classification, with the hope that there will be criticisms which will be of help in the making of a more permanent and authoritative division. The editor will be glad to receive criticisms, and later there will be published a permanent classification after the criticisms have been worked over by the editorial board.

The need of such a classification is brought out by examining the methods in use by the Index Medicus and one or two journals which divide the current orthopedic literature by subject. It will be found that it is impossible to file away the vast amount of literature that can be included in Orthopedic Surgery, under any such simple method as is used in the Current Literature Department of the JOURNAL. It is evidently the custom of certain men to keep on file the important orthopedic literature, and if this is done for any length of time there is an absolute necessity for a comprehensive scheme which will be definite enough so that articles can be filed and found. The editor is familiar with two such systems, which have been in use for several years, and it has been found that there is always some paper which is difficult to place.

The present classification which is here proposed has been completed for two months, and has been thoroughly tested to see whether it was possible to classify literature during that time, and it has been found to be comprehensive enough to admit the literature during this period.

Probably one of the forthcoming criticisms will be that this scheme is too large and not based on an anatomical or etiological method. It was first proposed that such a method should be used, but when this was attempted, it was found to be difficult to decide on the etiology of certain conditions. For an example, the subject of Chronic Arthritis is still so obscure that no etiological basis will hold at the present time. So also would it be difficult to classify the various papers on such subjects as back-pain, because they might be classified etiologically under strain, infection, etc. For these reasons the rather simple and scientific method of an anatomical or etiological basis was discarded.

The following scheme is proposed purely as a temporary classification, and any suggestions will be gladly received by the editor and will be considered by the committee. Then it is proposed so to label our own current literature department that it will be possible to file the various titles automatically.

#### CLASSIFICATION OF ORTHOPEDIC LITERATURE.

Whenever necessary, under the headings in Arabic numerals, we suggest the use of anatomic subdivisions indicated by letter:—for instance, V, 3 (Joint Tuberculosis) may have subheadings as follows: a. Trunk, Spine and Pelvis. b. Upper Extremity, including Shoulder. c. Lower Extremity.

##### I.

#### ORTHOPEDIC SURGERY.

1. History and Literature (Biography).
2. Textbooks and Treatises.
3. Congresses and Conventions.
4. General Writings of Orthopedic Surgeons.

##### II.

#### CARE OF CRIPPLES.

1. General Articles on Sanitarium Treatment of Orthopedic Cases.
2. Education of Cripples.

##### III.

#### ORTHOPEDIC OPERATIVE, POST OPERATIVE, AND ADJUVANT TECHNIC.

1. General Articles.
2. Tendon Transplantation and Other Tendon Operations.
3. Bone and Joint Transplantation and Grafting.
4. Arthrodesis.
5. Mobilization of Joints. Arthroplasty.
6. Osteotomy.
7. Military Orthopedic Surgery.
8. Use of Plaster of Paris.
9. Use of Roentgen Ray.
10. Exercise Treatment.
11. Use of Apparatus.
12. Massage.

##### IV.

#### RESEARCH IN BONE GROWTH AND REGENERATION. SKELETAL ANATOMY AND PHYSIOLOGY.

1. General Articles.

##### V.

#### TUBERCULOSIS. (For Sanitarium Treatment, see II).

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Bone Tuberculosis.
3. Joint Tuberculosis.
4. Tuberculosis of Tendon Sheaths and Bursae.

##### VI.

#### VENEREAL DISEASES. (For Syringomyelia see XVI).

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Syphilitic Bone and Joint Disease.
3. Gonorrheal Bone and Joint Disease.
4. Tabetic Joint Disease (Charcot's).

## VII.

## OSTEOMYELITIS.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Acute Diffuse Osteomyelitis.
3. Acute Circumscribed Osteomyelitis.
4. Chronic Diffuse Osteomyelitis.
5. Chronic Circumscribed Osteomyelitis.

## VIII.

## PERIOSTITIS.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Acute Periostitis.
3. Chronic Periostitis. (Policeman's Heel).

## IX.

## CONGENITAL DISLOCATIONS AND LUXATIONS.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Congenital Dislocations of Trunk, Spine, and Pelvis.
3. Congenital Dislocations of Upper Extremity, including Shoulder.
4. Congenital Dislocations of Lower Extremity.

## X.

## OTHER CONGENITAL ABNORMALITIES. (For Chondrodystrophia Fetalis and Osteogenesis Imperfecta, see XVI; for Congenital Visceroptosis, see XVIII; for Congenital Luetic Disease, see VI; for Congenital Scoliosis, see XVII; for Congenital Torticollis, see XIII.)

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Abnormalities of Trunk, Spine, and Pelvis. (Numerical Variations in Spine; Cervical Rib; Spina Bifida; Funnel Chest, Sprengel's Deformity, etc).
3. Abnormalities of Upper Extremity, including Shoulder. (Madelung's Deformity).
4. Abnormalities of Lower Extremity. (Club Foot.)

## XI.

## ACUTE INFECTIONS OF JOINTS AND BURSAE.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Acute Articular Rheumatism.
3. Epiphysitis.

## XII.

## CHRONIC INFECTIONS OF JOINTS AND BURSAE (NON-TRAUMATIC).

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Arthritis Deformans. (Hypertrophic Arthritis, Degenerative Arthritis, Osteoarthritis, Spondylose Rhizomelique, Strumpell-Marie's Disease, von Bechterew's Disease, Morbus Coxae Senilis, Heberden's Nodes, Joint Incongruence.)
3. Toxic Arthritis. (Infectious Arthritis, Still's Disease.)
4. Atrophic Arthritis. (Rheumatoid Arthritis.)
5. Villous Arthritis. Lipoma Arborescens.
6. Foreign Bodies in Joints.
7. Internal Derangement of Knee Joint.
8. Perthes' Disease.
9. Intermittent Hydrops.
10. Subacromial and Subcoracoid Bursitis.
11. Haemarthrosis.
12. Ankylosis.



## XIII.

## ACUTE AND CHRONIC AFFECTIONS OF MUSCLES, TENDONS, AND LIGAMENTS.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Myositis. Lumbago.
3. Myositis Ossificans.
4. Tennis Elbow (Epicondylitis).
5. Trigger Finger.
6. Base Ball Finger.
7. Ganglion.
8. Contractures of Tendons and Ligaments. (Dupuytren.)
9. Snapping Knee.
10. Fibrositis.
11. Torticollis.

## XIV.

## PARALYTIC CONDITIONS. (For Paralysis in Pott's Disease, see V.)

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Infantile Paralysis. (Poliomyelitis.)
3. Spastic Paralysis. (Little's Disease.)
4. Obstetrical Paralysis.
5. Landry's Paralysis.
6. Volkmann's Ischaemic Paralysis.

## XV.

## NERVE AFFECTIONS AND NEUROSES, INCLUDING NEUROPATHIC CONDITIONS. (For Tabetic Joints, see VI; for Torticollis, see XIII.)

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Intermittent Claudication.
3. Erythromelalgia. Reynaud's Disease. Gangrene. (Ainhum.)
4. Bone Atrophy.
5. Progressive Muscular Atrophy.
6. Hysterical Joint Affections.
7. Writer's Cramp.
8. Wrist Drop.
9. Sciatica.
10. Syringomyelia.

## XVI.

## METABOLIC DISEASES AND DISEASES OF INTERNAL SECRETION.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Rickets. Knock Knee. Bow Leg.
3. Adolescent Rickets. Adolescent Coxa Vara and Coxa Valga.
4. Coxa Vara.
5. Coxa Valga.
6. Chondrodystrophia Fetalis. (Achondroplasia.)
7. Osteogenesis Imperfecta.
8. Osteitis Deformans. (Paget's Disease.)
9. Acromegaly. Leontiasis Ossea.
10. Osteomalacia.
11. Gout.

## XVII.

## SCOLIOSIS.

1. General Articles (Pathology, Diagnosis, and Treatment).

## XVIII.

## STATIC OR POSTURAL DEFECTS.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Attitudinal Defects. Weak Back. Round Shoulders.
3. Vertebral Insufficiency.
4. Spondylolisthesis.
5. Postural Albuminuria.
6. Flat Foot. Valgus.
7. Metatarsalgia. (Morton's Toe.)
8. Hammer Toe. Hallux Valgus. Hallux Varus. Hallux Rigidus.
9. Growing Pains.
10. Visceroptosis.

## XIX.

## TRAUMATIC CONDITIONS. (For Congenital Dislocation, see IX.)

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Fractures. Pseudarthrosis.
3. Dislocations.
4. Sprains, Strains, Ruptures of Muscles.

## XX.

## NEOPLASMS.

1. General Articles (Pathology, Diagnosis, and Treatment).
2. Exostosis.
3. Sarcoma.
4. Chondroma.
5. Lipoma.
6. Epithelioma.
7. Osteoma. Endothelioma. Angioma.

# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus Etc.
- X. War Surgery.

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## I. TUBERCULOSIS OF BONES, JOINTS AND TENDONS.

THE HANDLING OF CHILDREN WITH TUBERCULOSIS OF THE SPINE WHILE THEY ARE UNDER THE INFLUENCE OF AN ANESTHETIC. Walter G. Elmer. *Annals of Surgery*, July, 1916.

Dr. Elmer in his article brings to our attention the necessity for care in the handling of tuberculous spines during and after the operation for bone graft.

He mentions two cases, one of whom died in a few days, and the other was seriously affected by careless handling upon the operating table. In both a perceptible increase in the kyphosis took place. To obviate this he recommends the preparation of a plaster corset the day before. The corset is cut in half at the mid-axillary lines, and the patient during his operation lies constantly in one half or the other, according as he is prone or supine. The child is not to be moved unless both halves are in place, and also the patient is kept in bed with the corset thus strapped together.

The paper calls to mind the need of particular care in such cases.—H. A. Pingree, Portland, Maine.

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ANATOMIC FORM AND POSTURE. IMPORTANT FACTORS IN THE TREATMENT OF PULMONARY TUBERCULOSIS. Joel E. Goldthwait. *Boston Medical and Surgical Journal*, July 20, 1916, p. 88.

Referring to the two types of human, as described by him, Goldthwait says the carnivorous is commonly tuberculous; the short small intestine, poorly nourished tissues, low blood pressure and low resistance, with anemia and disturbance of glandular secretion, being reasons for considering the carnivorous type. Associated with and causing these symptoms is the generally faulty posture of such cases with a flattened and narrowed chest and visceroptosis, which interferes with normal bodily functions, all of which cause a lowered resistance and susceptibility to disease, especially tuberculosis. Goldthwait makes a plea for the consideration of posture and breathing being corrected to increase the individual vitality and pulmonary efficiency to combat tuberculosis. The article is well illustrated with the incorrect postures and the correct position for proper breathing.—Custis Lee Hall, Washington.

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES, NERVE LESIONS WITH ARTHROPATHIES.

**DIAGNOSIS AND TREATMENT OF POLIOMYELITIS.** W. L. Barber. *Medical Record*, July 22, 1916.

Diagnosis of poliomyelitis is not usually possible until the paralysis makes plain the localizing of the infection in the spinal cord. Where the onset is of a few days' duration a differentiation from intestinal toxemia, typhoid fever or cerebrospinal meningitis may be called for.

The treatment is divided into: first, specific treatment directed to the specific cause; second, the symptomatic, directed to the morbid changes and their manifestations as brought out by the symptoms.

Prevention includes isolation of the patient and his surroundings, destroying or sterilizing everything that may have become contaminated with the virus. Keep the nose and throat well sprayed with a solution of hydrogen peroxid and administer hexamethylenamin. The patient should be kept in quarantine for at least five weeks.

It is hoped that a specific serum may be secured which will mitigate the end-results of the disease or at least prove of some value in its prevention, but this is only in the experimental stage at present. Symptomatic medication consists of calomel for the bowels; acetphenetidin for headache, tenderness of muscles, and restlessness. Local application of heat for muscle pain. Hexamethylenamin combined with benzoic acid for its germicidal action, and after the inflammatory effects have subsided strychnine should be given in gradually increasing doses.

Other measures, such as electricity, massage and muscle training, should be left to the supervision of an expert orthopedic surgeon.—*Robert B. Cofield, Cincinnati.*

**REVIEW OF 127 CASES OF ATAXIC PARAPLEGIA.** G. H. Bigelow. *Boston Medical and Surgical Journal*, July 20, 1916, p. 99.

In a study of 127 cases of ataxic paraplegia in the Out-Patient Department at the Massachusetts General Hospital a possible etiology was established in 53 cases. Forty-three of these were syphilitic from history, physical signs or laboratory tests. Accidents, acute infection and alcoholism claimed a few cases. In 44 cases no possible etiology could be established. This is an unusually large percentage of luetic cases, in contradiction to Osler and Gower, who believed syphilis only rarely had any etiological bearing. The author suggests that the evidence of lues is far less frank than usual, giving only moderately positive or even negative laboratory tests, but clinical evidence makes it certain that lues is an important factor in the etiology of ataxic paraplegia.—*Curtis Lee Hall, Washington.*

**POLIOMYELITIS WITH ITS PREPARALYTIC SYMPTOMS.** Louis Fischer. *Medical Record*, July 29, 1916.

The early stage of poliomyelitis is characterized by a sudden onset with high temperature, lasting several hours or days, headache, pain in the back and limbs, and sometimes rigidity of the trunk and neck. The patellar and plantar reflexes may be exaggerated, diminished or even absent. The spinal fluid obtained by puncture is colorless and devoid of pathogenic bacteria. There is an increase of the leucocytes, especially the polynuclear percentage, in the earlier stages, later a mononuclear increase. The globulin reaction in the beginning is negative, later it is positive. Flexion of the spine anteriorly produces pain and stiffness of the neck. The lymph glands of the body are enlarged. A peculiar twitching, tremulous or convulsive movement of a

part or the whole of one limb, the face or jaw, has been described by Culliver. It may also affect the whole body. This condition is sometimes accompanied by a peculiar cry, similar to the hydrocephalic.

The author describes three types most commonly met with: the catarrhal, the gastrointestinal and the cerebral.—*Robert B. Cofield, Cincinnati.*

THE NATURE, MANNER OF CONVEYANCE AND MEANS OF PREVENTION OF INFANTILE PARALYSIS. Simon Flexner. *Jour. Amer. Med. Assn.*, July 22, 1916, p. 279.

This is a résumé of our present knowledge of infantile paralysis and should be read in full.

The nature, location of the organism in the sick, and in the healthy, are taken up. The virus escapes from the body through the nose, throat and intestines, and enters as a rule, if not exclusively, through the nose and throat. The virus is not easily destroyed by ordinary chemicals, but is easily killed by exposure to sunlight.

The present knowledge excludes insects as active agents in the spread of the disease.

The paralytic diseases of domestic animals are quite different from infantile paralysis. The usual incubation is eight days. One attack gives protection.

Serum treatment is said to be promising, but the only drug that is useful is hexamethylenamin.—*E. S. Hatch, New Orleans.*

EPIDEMIC POLIOMYELITIS, THE SYMPTOMATOLOGY AND DIAGNOSIS IN THE ACUTE STAGES. Francis R. Fraser. *Boston Medical and Surgical Journal*, July 20, 1916, p. 83.

The preparalytic symptoms are fever of sudden onset, drowsiness, general weakness, loss of appetite, vomiting, irritability when roused, caused by diffuse muscle pain and tenderness, mild opisthotonos may be present, and general muscular weakness. Spinal fluid shows globulin increase and cell count, and blood is normal. General symptoms of nervous disturbance in supposedly acute infections are suspicious. Lumbar puncture in obscure cases will differentiate cerebrospinal meningitis, but photophobia, rash, and organism in spinal fluid should make diagnosis clear.—*Custis Lee Hall, Washington.*

REFLEX PARALYSES AND REFLEX TROPHIC DISTURBANCES CONSEQUENT TO WOUNDS OF THE EXTREMITIES. H. Gougerot and A. Charpentier. *Annales de Médecine*, May-June, 1916.

In the present military hospitals of Europe such cases as are here referred to are not infrequently encountered, and constitute puzzling problems. Certain apparently trifling perforating wounds of the hands or feet, not involving bones, joints or any important structures, healing rapidly and without surgical complications, entail, nevertheless, a more or less prolonged and painful disability of the part injured, the symptoms and the areas affected being out of all proportion to the ascertainable lesions.

Following several recent publications on this subject, notably by Babinski and Froment (*Presse Médicale*, Feb., 1916), the authors have reviewed their own cases in the present interesting, if inconclusive, article. They point out "... the contrast between the localization of the wound, its apparent benignity and the importance, the diffusion, the ascending character of the paralytic and very often trophic disturbances, the frequency of the 'ascending' pain (*douleurs ascendantes*), sometimes intense, the discouraging persistent character of the pains, of the paralyses and of the trophic disturb-

ances, and often the progressive aggravation throughout a long period after the wounding; in one word, the gravity of the prognosis." The various hypotheses upon which one might seek to explain such cases are passed in review, and in turn abandoned. They do not conform to the "ascending neuralgias" nor to the "ascending neuritides" of Landouzy, Raymond and Brissaud, nor can they be due to infection, to immobilization, to prolonged disuse, nor are they simply hysterical in origin.

As this is an almost purely neurological presentation of the question, this abstract aims merely to indicate the nature of the discussion. The recognition of such cases is, however, a matter of importance. Though failing to explain the origin of the perplexing and apparently uncorrelated features, the authors do not hesitate to advise energetic mechano-therapy in the treatment of these cases. Excepting for those cases with prominent painful symptoms, such measures definitely hasten recovery. In the latter group of cases, however, this treatment is often difficult or impossible; the prognosis in this group is less favorable.—*Roades Fayerweather, Baltimore.*

A PLAN OF TREATMENT IN INFANTILE PARALYSIS. Robert W. Lovett. *Jour. Amer. Med. Assn.*, August 5, 1916, p. 421.

The appropriate treatment of infantile paralysis in the acute, convalescent and stationary stages is reviewed, with emphasis on those measures which have proven most valuable in the author's long experience. In the first, or acute stage, rest, urotropin and prevention of deformities are indicated. In the second or convalescent stage, which lasts two years or more, the problem is to restore maximum function to the affected muscles (the author believes that relatively few are totally paralyzed), and for this, careful ambulation is advised, together with muscle training, massage, heat and electricity, in order of value. In the third or stationary stage, operative measures to restore function and stability are briefly reviewed, tendon transplantation being considered the "most brilliant."—*Eben W. Fiske, Pittsburgh.*

SEROTHERAPY OF POLIOMYELITIS: THIRTY-TWO CASES. Arnold Netter. *Archiv. de Médecine des Enfants*, Jan., 1916.

In October, 1910, the author for the first time treated an acute case of poliomyelitis in man by intraspinal injections of serum obtained from individuals recovered from the disease. (Reported Apr. 7, 1914, *Académie de Médecine*. Flexner, *J. A. M. A.*, Aug. 19, 1916, p. 584, says: "Netter was the first to apply the data obtained by experiments on monkeys to the treatment of cases of epidemic poliomyelitis in man.") During the past five years he has employed this treatment in 32 cases, of which summaries are here presented. The first three cases were treated in 1910, the last ten in 1915.

As to results, Netter enumerates six complete and rapid cures; three ameliorations approximating cures; seven ameliorations of very definite character; five appreciable ameliorations, in which the influence of the serum, however, is open to question; three cases not affected by the treatment; eight deaths, of which seven were due to extension to the medulla. In concluding he writes: "Serotherapy can arrest the progress of the paralysis, and can effect the disappearance of paralyses already developed, provided it is applied early (from the first to the fourth day of the paralysis). Practised in the pre-paralytic stage, it may prevent the appearance of the paralysis. We can report but a single case of this kind, but it is not destined to remain unique, for, under certain conditions which we have emphasized, one may justly suspect the infection with the virus of poliomyelitis in the absence (*as yet*) of any paralysis. The serum of individuals who have had an infantile

paralysis retains its efficacy for more than thirty years. We employ so far as possible serum from individuals whose paralysis dates back less than five years; the serum withdrawn aseptically is sterilized by 'tyndallisation' (fractional sterilization). It is taken from healthy persons, subjected to the Wassermann test. The injection should be made into the spinal canal, and should be repeated on the average for eight consecutive days. The doses vary from 5 to 13 cubic centimetres. Better tolerated by the spinal canal than horse serum, human serum provokes, nevertheless, an inflammatory reaction of the meninges. This reaction, generally to be detected only by changes in the cellular composition of the spinal fluid, may manifest itself by fever and pain. These phenomena are rarely severe and are usually of short duration. Their possibility should not prevent the employment of serotherapy in poliomyelitis any more than the use of anti-meningococcic serum in cerebrospinal meningitis."

This paper will repay a perusal in the original by anyone employing this method of treating the disease.—*Roades Fayerweather, Baltimore.*

**PARALYTIC FEET.** Percy Willard Roberts. *New York Med. Jour.*, 1916, ciii 826-7.

The operation described is evidently an attempt at an arthrodesis of the astragalotibial joint. Roberts prefers it to the Whitman operation, arguing that it gives more stability. As Whitman emphasizes in his operation, so Roberts says the fibula should extend over the os calcis.—*M. S. Henderson, Rochester, Minn.*

**INTRADURAL NERVE ANASTOMOSIS IN SELECTED CASES OF POLIOMYELITIC PARALYSIS.** N. Sharpe. *New York Medical Journal*, July 1, 1916.

Roots selected for transplanting are those whose function can be dispensed with, such as the twelfth dorsal and first and second lumbar, which supply trunk muscles having other nerve supply. Its use is suggested in extreme paralysis, where the growth would be interfered with otherwise. Reference is made to the works of Kilington, and also Frazier and Mills. Reports experiments on dogs for past two years. Also reports three cases operated in two stages: first for laminectomy and opening of the dura, second for isolation, severance, and transplanting of nerve roots. No report of subsequent condition of cases except through immediate convalescence.

Author believes with improved technic, operation in one step will be possible.—*C. L. Lowman, Los Angeles.*

**THE PROGNOSIS IN INFANTILE PARALYSIS.** Walter G. Stern. *Jour. Amer. Med. Assn.*, July 29, 1916, p. 325.

Few diseases of such serious nature are so little understood by the medical profession at large as is infantile paralysis. It is at times one of the most fatal of all the infectious diseases of childhood, while recovery usually means a lifelong struggle against crippledom.

Medical science has been powerless to prevent or even check the spread of epidemics, the diagnosis is rarely made until after the advent of a frank paralysis, the immediate curative treatment has been futile, and a correct outlook as to the future progress of a given case rarely foretold.

The severity and extent of the paralysis is not always proportional to the severity of the infection.

Complete recovery from the paralyzes is not as frequent as some writers report: partial recovery of muscle power with a more or less satisfactory recovery of function is the rule. Few cases are so completely paralyzed that there is not some opportunity for improvement.

The prognosis for recovery in a given case depends upon many indeterminate factors:

1. Amount of actual permanent destruction of ganglion cells of the anterior horns.
2. Amount of neighboring cell congestion and edema.
3. Regenerative and reconstructive powers of the nervous system.
4. Muscle degeneration and overstretching.
5. Bone and joint deformity.
6. Curative effect of proper treatment.

The early spontaneous improvement in muscle power, the recovery of the reflexes and the loss of the reaction of degeneration are good indications that recovery is taking place, but the persistence of these symptoms is no indication that improvement cannot occur.

Six months is the time limit usually set for spontaneous recovery, but a great deal of further improvement can be secured by proper treatment, which consists of rest in bed, with the afflicted members supported in the physiological position, for a longer or shorter period after the acute stage has passed, combined with the use of massage and electricity to keep up the vitality of the muscle body, resistance exercises and muscle training.

The greatest danger during convalescence and in the early part of the chronic stage is overexertion and misuse of the afflicted parts. This often gives rise to damaged joints and overstretching and weakening of the afflicted muscles.

Overeating and excessive gain in body weight should be avoided.

Operative interference should be avoided until all hope of spontaneous improvement has passed.—*Walter G. Stern, Cleveland.*

#### TIME RELATIONS OF INFILTRATING CELLS IN ACUTE ANTERIOR POLIOMYELITIS.

A. E. Taft. *Jour. of Infectious Diseases*, July, 1916.

This is an account of experiments on two series of monkeys, thirty-eight in all. One series injected subdurally with virus from spinal cords of monkeys dying of poliomyelitis; the other series injected with virus from various sources. Similar results were obtained in all cases. Those of short incubation and brief duration before death showed a corresponding abundance of polymorphonuclear cells in the pericellular infiltrate and extreme degeneration of anterior horn cells. Those in which death was delayed weeks or months showed a persistence of small round-cell infiltration, but no polymorphonuclear leucocytes, even in cases with extreme nerve-cell destruction.—*R. Wallace Billington, Nashville.*

#### SYMPOSIUM ON INFANTILE PARALYSIS. New York Academy of Medicine, July 13, 1916. *Jour. Amer. Med. Assn.*, July 22, 1916, p. 310.

The abortive type is dangerous because it is often unrecognized, and the disease is spread to others. These cases should be called atypical.

There are five general groups, as follows:

1. Gastrointestinal.
2. Respiratory.
3. Febrile.
4. A type characterized by symptoms of meningismus.
5. The type in which paralysis occurs.

The most reliable aid in recognition of the disease is the examination of the spinal fluid. This is the first epidemic in New York in which the disease has been made reportable and in which there has been an effort of hospitalization. The treatment of the disease at this time can only be symptomatic, but



D. Meltzer advises the injection of epinephrin, to begin with 0.5 cc.—*E. S. Hatch, New Orleans.*

### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

CASES OF PNEUMOCOCCUS ARTHRITIS AND VERY UNUSUAL TYPE OF BRONCHOPNEUMONIA. A. L. Levin. *New Orleans Med. and Surg. Jour.*, June, 1916.

A case of pneumococcus arthritis which may have been caused by the passing of a probe through the tear duct is reported. The right knee was infected, and the leg above and below the knee was secondarily infected. The result was good, but life was despaired of for some time.

The second case is reported to discuss the probable diagnosis of bronchopneumonia.—*E. S. Hatch, New Orleans.*

ACUTE ARTHRITIS EXPERIMENTALLY PRODUCED BY INTRAVENOUS INJECTIONS OF THE STAPHYLOCOCCUS PYOGENES. Edgar C. Steinharter. *Boston Med. and Surg. Jour.*, July 13, 1916, p. 59.

A strain of staphylococcus from blood culture in a case of septicemia was inoculated and reinoculated into rabbits. In some of the cases the organism showed a selective action for the joints, and cultures from these joints produced like lesions in joints of other rabbits when inoculated. An organism such as the staphylococcus grown in the joints seems to have a selective action to generate in joint tissue, provided the tissue was suitably altered for its production. Steinharter believes that organisms of a certain strain of virulence show a definite predilection for joint tissue.—*Custis Lee Hall, Washington, D. C.*

OPERATIVE TREATMENT OF OSTEOARTHRITIS. W. I. DeC. Wheeler. *Lancet*, June 24, 1916.

Wheeler's patient, a female aged 21 years, a victim of polyarticular chronic rheumatoid arthritis, was operated upon in 1912. At that time she was nearly helpless, the left knee being semi-flexed and the right hip so painful that weight-bearing was impossible; abduction was especially limited. The use of crutches was very difficult on account of the painful condition of the wrists. In September, 1912, the left knee joint was operated upon by chiselling the lipping away from the tibia, there being a well-marked line of cleavage. A few days after operation the joint could be fully extended and flexed without pain. One month later the lipping was chiselled away from the right hip joint. In two weeks she could bear weight on the right leg, and movements were free and easy. His examination of the patient three and one-half years later shows that the improvement has been permanent, and the patient is at present engaged in a munition plant.—*M. S. Henderson, Rochester, Minn.*

### V. SCOLIOSIS AND STATIC DISTURBANCES.

TREATMENT OF SCOLIOSIS. E. S. Hatch. *Southern Med. Jour.*, July, 1916.

The classification of scoliosis is spoken of and the Abbott treatment is advised for the structural variety. This treatment is explained in some detail and many illustrations are given, showing the patients before, during, and after treatment.—*E. S. Hatch, New Orleans.*

## VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.

BONE SARCOMA TREATED BY RADIUM. J. B. Bissell. *New York Med. Jour.*, July 1, 1916.

Reports two cases of spindle cell osteosarcoma, one in femur of boy nineteen; the other in a boy of five years.

Radium treatment for several months, with marked improvement. Author suggests that malignant disease may be a widely disseminated dyscrasia.—C. L. Lowman, Los Angeles.

DIAGNOSIS OF PERIOSTEAL SARCOMA WITH THE X-RAY. Frederic J. Cotton. *Boston Med. and Surg. Jour.*, June 29, 1916, p. 946.

Cotton noticed in several x-rays of suspected sarcoma of bone a peculiar vertical stalactite formation, perpendicular to the bone surface. He suggests that in all cases showing this formation, where there is bone thickening, it is strongly suggestive of sarcoma.—Custis Lee Hall, Washington, D. C.

OSTEOCHONDROFIBROMA, OR OSTEITIS FIBROSA. V. P. Gibney. *Medical Record*, June 10, 1916.

Report of a case of tumor of upper end of femur observed since 1913, when operation was done with pathological report of osteochondrofibroma. Two years later a similar involvement of fibula on same side was noted and the bone curetted, being reported a chondroma with calcified areas and cellular connective tissue. Radiograms of the rest of the skeleton were negative. The author at first thought it a case of osteitis fibrosa, but is now inclined to consider it an osteochondrofibroma, though the features of the case, as reported, are confusing.—R. Wallace Billington, Nashville.

A TRANSPLANTABLE CHONDRO-OSTEOSARCOMA IN A DOG. John E. McWhorter and Frederick Prime, Jr. *Annals of Surgery*, July, 1916.

The authors give a report upon the transplantation of malignant tumor through a series of many dogs in an effort to establish the continuous growth of neoplasms in the canine species. A detailed report of the operations and tissue examinations is included in the article. The conclusions follow.

A mammary chondro-osteosarcoma arising spontaneously in a dog has been transplanted into other dogs through three generations, covering a period of ninety days.

By far the most successful growths took place in very young puppies, and particularly in those of nearly the same breed as that in which the original tumor grew.

The tumor showing bone as found in the puppies of the first generation more nearly resembled the original tumor than did the growths in adult dogs.

Therefore it is not unreasonable to assume that by using very young puppies of the right breed, a tumor strain might be developed similar to that already established in rats and mice.—H. A. Pingree, Portland, Maine.

SARCOMA OF TIBIA WITH METASTASIS TO CHEST. E. P. Tompkins. *New York Med. Jour.*, June 3, 1916.

Report of a case of secondary sarcoma in mediastinum coming on one year after amputation of leg for sarcoma of tibia. The most noticeable chest symptoms were dyspnea and coughing. Death occurred twenty months after onset of first symptoms.—C. L. Lowman, Los Angeles.

## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

CONGENITAL ELEVATION OF THE SCAPULA. Samuel Cohen. *Medical Record*, June 10, 1916.

Report of a case of Sprengel's deformity in which were associated a number of the usual accompanying defects. Heredity did not seem to be a factor. No treatment was reported or suggested.—*R. Wallace Billington, Nashville.*

## VIII. TRAUMATIC LESIONS, FRACTURES AND DISLOCATIONS.

COLLES' FRACTURE. I. A. Arnold. *Amer. Jour. of Surgery*, July, 1916, p. 220.

Arnold describes Colles' fracture. He also describes the usual and proper method of reduction. He believes in immobilizing both the wrist and finger joints for at least eight or ten days.—*Alex. R. Colvin, St. Paul.*

SPRAINS AND SPRAIN FRACTURE OF THE WRIST JOINT. A. C. Burnham. *Boston Med. and Surg. Jour.*, July 26, 1916, p. 118.

The symptoms of sprain, fracture and sprain fracture are much the same, and complete dependence cannot be put upon the roentgenogram. Local "wincing" tenderness over site of fracture pathognomonic. A large percentage of sprains when rayed show fracture. When there is any doubt, sprains should be treated as a potential fracture. The mechanism of the injury and wincing tenderness usually clear up doubtful cases.—*Custis Lee Hall, Washington, D. C.*

A TRACTION BANDAGE FOR REDUCTION OF FRACTURES OF THE LEG. Howard D. Collins. *Annals of Surgery*, July, 1916.

Collins has briefly and concisely described a very ingenious hitch or sling for the ankle when traction upon the limb is desired and while plaster or splints are being applied. The sling is made of one length of bandage, and requires no sewing or material other than a little padding. The illustrations accompanying the article are more descriptive than anything that can be written.—*H. A. Pingree, Portland, Me.*

THE TREATMENT OF FRACTURES OF THE FEMUR WITH HODGEN'S SPLINT: INCLUDING A BIOGRAPHICAL NOTE ON ITS INVENTOR. Duncan Eve, Jr. *Amer. Jour. of Surgery*, July, 1916, p. 217.

Eve reports groups of statistics of fractures of the femur by different authorities. He believes that 85 to 90% of all long-bone fractures can be successfully treated by the closed method. He believes that Hodgen's splint is the best splint to use in fractures in any part of the femur. He describes fully the method of making it and gives the detail of its employment.—*Alex. R. Colvin, St. Paul.*

CASE OF EXTERNAL DISLOCATION OF KNEE. R. H. Fowler. *New York Med. Jour.*, June 10, 1916.

Dislocation occurred following fall of twelve feet from fire escape. Position when first seen: knee flexed; abduction and external rotation of thigh; knee fixed; patella dislocated over the inner condyle; internal tubercle of the tibia lay in the condyloid notch. Reduced under ether with traction. Plaster four weeks, then a lighter splint. Case failed to return.

Reports only a moderately small number in literature, especially of this type.

Prognosis is grave because of size of joint and liability of injury to popliteal vessels.—*C. L. Lowman, Los Angeles.*

FRACTURES IN CHILDREN. Jacob Grossman. *Medical Record*, July 8, 1916.

The author mentions a number of differences to be observed between fractures in children and adults and reports a number of illustrative cases. The paper is based on a study of 200 cases between the ages of fourteen days and eleven years. Great emphasis is laid on "pencil" tenderness as a diagnostic sign. Only one per cent. were epiphyseal separations, and he thinks many cases so diagnosed by others are really fractures. He reminds us that fractures in children are often associated with very slight trauma. Early massage and movements are important in the treatment.—*R. Wallace Billington, Nashville.*

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THE SLIDING GRAFT AND THE KANGAROO SUTURE IN FRESH FRACTURES: ALBEE TECHNIC. Walter Lathrop. *Annals of Surgery*, July, 1916.

Lathrop in his paper speaks of many of the practical points in the use of bone-grafting for fracture. He lays special emphasis upon asepsis in bone surgery and upon plaster of Paris as a splint material. These are worthy characteristics for the general surgeon, and they should be heartily commended.

He treats, in a brief and concise way, of the technic in applying kangaroo sutures for the apposition of fragments. There are sixteen cuts, which indicate the position of fragments in several of the author's cases.

This article is practical, conservative, brief, and much to the point.—*H. A. Pingree, Portland, Me.*

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INTRACAPSULAR FRACTURES OF FEMUR. J. T. Nix, Jr. *New Orleans Med. and Surg. Jour.*, June, 1916.

A review of the Charity Hospital cases from 1905-1915 shows that 16.7% of femur fractures were intracapsular, the largest number being in elderly people. Most of the cases in the hospital were treated by Buck's extension, and in no case is mention made of a reduction of the deformity.

The results were good, but as regards restoration of contour and function, results were very poor.

Dr. Whitman's treatment is advised, namely: "Treat the fracture as a fracture, consistently, logically, viz: reduce by extension, align by abduction, and immobilize by fixation with a spica cast."—*E. S. Hatch, New Orleans.*

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THE METHODS OF CHAMPIONNIÈRE AND OF BARDENHEUER IN THE TREATMENT OF FRACTURES. Wm. W. Richardson. *Amer. Jour. of Surgery*, July, 1916, p. 209.

Richardson quotes an experience gained from an unusually large fracture material. When the attitude of one having such an opportunity is that of open-mindedness to the non-operative measures advised by the leaders of thought in this particular work the experience is sure to be valuable. Perhaps because traction or extension is so extensively used we are more ready to appreciate its value in the treatment of fractures. The part of the article under review devoted to Bardenheuer's method, which is simply one of traction in different directions, is practically a brief résumé of Bardenheuer's book, "Die Technik der Extensions Verbände." The part devoted to Championnière's method, which includes massage and passive movement, is more clearly the presentation of personal experiences and is thus the more valuable. The method is used in fractures of the forearm, especially Colles', of the hand, wrist and elbow, of the clavicle, neck of the humerus, foot and ankle, especially Pott's, and of the malleoli and in all fractures in some stage of their treatment. Convincing case histories are given. The indications for non-

operative and operative measures are presented in a very thoughtful manner.—*Alex. R. Colvin, St. Paul.*

**TREATMENT OF UNSTABLE SEMILUNAR CARTILAGES OF THE KNEE JOINT. REPORT OF CASE.** Royal Whitman. *Medical Record*, July 22, 1916.

Whitman considers this injury comparatively common, but probably more familiar to those interested in athletics than to physicians, many of whom have but the vaguest ideas as to the causes and consequences. Displacement of the internal cartilage, which is most frequent, is usually caused by external rotation of the tibia on the femur, or by internal rotation of the femur upon the fixed tibia while the knee is flexed. The sudden strain upon the internal lateral ligament, whose deep layer is attached to the cartilage, tears the latter loose from the margin of the tibia and displaces its anterolateral portion backward toward the interior of the joint, so that it is caught between the bones when the limb is extended.

An effective method of replacement is to put the patient on his back, flex the knee on the thigh and the thigh on the trunk. One then abducts the tibia on the femur to separate their inner margins, then rotates the tibia outward and inward and extends the limb; the patient usually feels something slip, and free motion is regained.

The immediate treatment after reduction should be fixation for a time sufficient for repair of the strained or ruptured ligament and reattachment of the cartilage to the tibial margin.

Recurrence is frequent, and where persistent instability occurs, in which the inconvenience is at all serious, or where a bandage or other support has to be worn constantly, removal of the cartilage is indicated, since a loose cartilage is of no functional value, but a dangerous encumbrance to the patient, and its removal does not impair the joint function.—*Robert B. Co-field, Cincinnati.*

**IX. MISCELLANEOUS DISEASES, GENERAL ORTHOPEDIC ARTICLES, PHYSICAL THERAPY, APPARATUS, ETC.**

**SOME TECHNICAL FEATURES OF LAMINECTOMY FOR SPINAL DISEASE AND INJURY, BASED ON ONE HUNDRED AND FIFTY SPINAL OPERATIONS.** Charles A. Elsberg. *Jour. Amer. Med. Assn.*, July 15, 1916, p. 168.

The author advises a space at least 1 cm. in width to be made, and better 1.5 to 2 cm. in the spinal canal. It is not enough to remove the arches of the fractured or dislocated vertebrae, but to take off one or two arches above and below so that the dural sac can bend backwards.

The knowledge of the normal and pathologic appearance of the cord is necessary in spinal work, and this is described here. In 150 cases the mortality was 10%, but if the cases that would have succumbed anyway are excluded, it brings the mortality down to 2.9%.—*E. S. Hatch, New Orleans.*

**X. WAR SURGERY.**

**ON THE TREATMENT OF GUNSHOT FRACTURES. A DESCRIPTION OF APPARATUS AND TECHNIC.** E. W. Hey Groves and T. H. Brown. *The Lancet*, Apr. 29, 1916.

The characteristics of gunshot fractures are great comminution with displacement, severe sepsis, great pain. There is danger of losing life or limb.

The aim of treatment should be:

- (1) Immobilization of fractured part for a prolonged period.

- (2) Thorough treatment of wound by free drainage and frequent dressings.
- (3) Restoration of the correct line and length of bone by extension in its axis.
- (4) Maintenance of both wound treatment and extension for a period of perhaps months.
- (5) The joints kept semiflexed for rest and relaxation of flexor muscles.
- (6) Massage and movement of limb from an early period.

The authors then give illustrations and description of apparatus and the technic of their use. It is a very good practical article and should be of value to civilian as well as army surgeons.—*F. G. Hodgson, Atlanta.*

**SOME OF THE PRINCIPLES AND PROBLEMS RELATED TO THE TREATMENT OF GUNSHOT FRACTURES.** Hey Groves. *Brit. Med. Jour.*, July 15, 1916.

Practically all the cases have come to Groves seven to ten days after injury. Every severe case of gunshot fracture presents two stages: In the first there is a wound complicated by a fracture and in the second there is a fracture complicated by a wound. The author states that it is a matter of judgment whether an attempt should be made to remove the missile. An irregular temperature, local tenderness, a rising leucocyte count and an infection by the streptococcus, *B. pyocyaneus*, coliform or gas-producing bacteria, are all facts which require immediate operation. From the author's own experience he states that, excluding those cases already so septic that death would have occurred in spite of amputation, he has found that certain groups have died as a result of deferring amputation. Anatomically they have been injuries of the femur and humerus; pathologically they have been: (1) concurrent infection of the knee joint, (2) secondary hemorrhage, (3) severely infected wounds of the thigh which could not be fully laid open; (4) loss of part of the femur associated with severe infection.

No bone fragments should be removed unless there is clear evidence of loss of vitality. The author goes on to state that while the ideal treatment for this group of fractures would be the treatment of the fracture by extension, at the same time as the treatment of the wounds, such is rarely possible. When nothing but granulation tissue can be seen in the wound the treatment of the fracture should be undertaken. In his hands extension by the Thomas splint has been disappointing, and he advocates, therefore, the continuous extension by the use of transfixing nails or screws. As a result of this practice of accurately applied extension he has had to resort very seldom to open operation. Unfortunately in this present war there will always remain one large class of cases which will require open operation, namely, ununited and malunited fractures of old standing. In old malunited fractures he operates in two stages, first breaking down the malunion by an open operation if necessary and then applying transfixion and extension, using 25 pounds in the case of the femur and keeping the limb slung up in a wire cradle. When the skiagram, usually in a week, shows the overlapping reduced, means can be taken to induce union either by the use of metal plates or wire or bone grafting, the author himself using often both a bone graft and plates and screws.—*M. S. Henderson, Rochester, Minn.*

**TRANSPLANTATION OF BONE, AND SOME USES OF THE BONE GRAFT.** Robert Jones. *Brit. Med. Jour.*, July 1, 1916.

Jones emphasizes the following general rules for transplantation of bone: (1) perfect hemostasis, (2) perfect asepsis, (3) a well prepared bed for the graft. For the union of the graft it is desirable that some part of the graft should be in contact with the medullary cavity, and perfect immobilization

should be provided. After the graft is united, carefully graded function should be put upon it, as Wolff's law must be remembered.

In the present war there have been many injuries to the spine which have been followed by the rapid development of a kyphos, sometimes due to traumatic osteoarthritis and sometimes due to tuberculous changes following the original injury. To shorten the treatment he advises either the Albee or Hibbs operation. He insists on three months' recumbency following the operation and thereafter the use of a light spinal support while the patient goes about at his usual occupation.

The tibia, the author states, is the bone of choice from which to obtain the graft, as the periosteum can be transplanted with the bone. The transplantation should be made immediately on removing the graft, for he is convinced that it is a mistake to wash the graft in saline or leave it in saline while something else is being done. Best results follow immediate closure of the deep tissues round the graft and suture of the surface wound.

He speaks against the use of plates and screws on the immediate treatment of fractures, saying that in any case a metallic plate is a foreign body, while transplanted bone can be built into the structure of the part, and therefore assists osteogenesis. In his experience spiral fractures of both bones of the leg, particularly the lower third, are the only fractures demanding immediate operation, and here the bone graft is his choice, and plates and screws the second choice. The sliding inlay graft of Albee is here the method advocated. In fractures in other situations the method of grafting varies according to the difficulties.

In this paper Jones insists that operation for delayed union should not be undertaken too early. Surgeons should have patience, for union is often delayed, and hasty conclusions that union is not going to take place, and consequent relaxation of strict fixation of the part, may convert a case of delayed union into one of non-union. It is difficult to formulate a rule as to when the operation should be performed, for we seem never to be quite free from the danger of recrudescence sepsis, and his habit is to wait six months after a sinus is closed, during which time and for a variable period afterwards efforts can be made to improve the general nutrition of the limb. It frequently happens that during this delay union of the fragments takes place, and no transplantation is needed.—*M. S. Henderson, Rochester, Minn.*

ORTHOPEDIC SURGERY IN WAR TIME. Robert B. Osgood. *Jour. Amer. Med. Assn.*, August 5, 1916, p. 418.

This is a concise review of the many important phases of war orthopedics. The maintenance of physical efficiency, by attention to posture, prophylactic examination of the feet, and proper shoeing, as well as conservation and restoration of function following wounds of the extremities, by the prevention of deforming contractions and ankylosis, demands the attention of the orthopedic surgeon. In the latter condition the author emphasizes the importance of avoiding drastic interference with infected joints except when definitely indicated, as he has been much impressed with the natural resistance of synovial membrane. He speaks of the value of massage, and simple pendulum mechano-therapeutic machines in this work, and of ultimate operative procedures as orthopedic "tasks and opportunities." Furthermore, fully as urgent as the foregoing, is the after-care of the cripple, both physically, as in the provision of useful prostheses, for example, and socially, by the advocacy and oversight of occupational training, that these "heroes" may not become burdens on the community. The author concludes with the recommendation of a national orthopedic reserve to meet such problems, should need arise in this country.—*Eben W. Fiske, Pittsburgh.*

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# *The American Journal of Orthopedic Surgery*

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# *The American Journal of Orthopedic Surgery*

## EXPERIMENTAL BONE TUBERCULOSIS.

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IN the experiments here described, foci of tuberculosis have been established in the various regions of the bones of young dogs. The epiphysis and diaphysis of the femur, the knee joint, and the subperiosteal bone of the femur and tibia were chosen as proper and accessible regions for the location of these foci. Virulent human and bovine tubercle bacilli grown on glycerin agar media were used.

The object of these experiments was to study the early stages of the growth of a focus of tuberculosis in the bony tissue and on the joint surface.

### EXPERIMENTAL METHODS.

#### I. Epiphyseal Tuberculosis.

Through a linear incision over the lateral condyle of the femur, the knee joint capsule was exposed. This was incised in the line of the incision, and the patella was retracted medialwards. In the notch below the patella a trap-door opening was made through the surface of the epiphysis, and in the marrow there was then implanted a platinum loop of tubercle bacilli removed from a growing culture. The trap-door opening was then closed, and the wound was closed with fine silk.

#### II. Diaphyseal Tuberculosis.

Through a linear incision over the outer lateral and lower third of the femur the bone was exposed just above the epiphyseal line and a small trap-door opening was made, and into the marrow was then introduced

a platinum loop of tubercle bacilli from the growing culture. The trap-door was then closed and the wound was closed with fine silk.

### III. Subperiosteal Tuberculosis.

Through a linear incision on the surface of either the femur or tibia the periosteum was split in the line of incision and elevated from the bone. A platinum loop of tubercle bacilli was then implanted between the periosteum and the bony cortex. In several experiments the cortical bone was scratched by the periosteal elevator. The periosteum was then closed and the wound was closed with fine silk.

### IV. Joint Surface Tuberculosis.

The knee joint was opened by a linear incision on the lateral condyle of the femur. Several platinum loops of tubercle bacilli were then introduced into the joint cavity, selecting the lateral spaces of the joint cavity for the implantation. Wound was then closed with fine silk.

In each experiment all bleeding from injured bone was checked before the implantation of the tubercle bacilli.

In all experiments the animals were anesthetized with ether, and the operative procedures were done with aseptic technic. All animals were sacrificed under chloroform.

### NUMBER OF EXPERIMENTS.

In this series, in all, forty experiments were done. Of these, eleven were epiphyseal tuberculosis, six were diaphyseal tuberculosis, nineteen were subperiosteal tuberculosis; and four were joint surface tuberculosis.

In addition to these, one experiment was done on an ankylosis of the knee joint. This ankylosis had been established in a previous set of experiments on ankylosis, and the animal had used the limb in function for over a year with the bony ankylosis of the knee. This ankylosed knee joint was infected with tubercle bacilli.

The authors carried on also a series of experiments on inoculation of the blood stream, using the femoral artery and vein. These experiments were all negative, giving no positive establishment of foci.

### GROSS PATHOLOGY.

The joints were fixed in formalin immediately after their removal, then decalcified before being opened. In this way the normal relations between ligaments and bone were left intact, and thin sections through the joint could be made and studied without difficulty.

In all the animals the foci made at operation were easily found, and

varied in size from 1 to 15 mm. in diameter, depending upon the length of time of the experiment. In the experiments where a trap-door had been made, it was found to be healed in place, and joint surfaces appeared normal.

In the experiments in which the diaphysis was chosen as the site for inoculation, there were localized gray areas, with no destruction of the epiphyseal line or apparent extension into the shaft.

The periosteum was lifted from the bone in the dogs in which a subperiosteal focus was made. The early cases showed a mass of culture media attached to the denuded bone, while those animals which were allowed to live for six to eight weeks had small subcutaneous abscesses. The animals were sacrificed before sinuses formed.

Joints which were inoculated were distended, and on opening them there was an escape of a thin yellow fluid. Small masses of fibrin and granulation tissue were found on the joint surfaces.

One animal in which a tuberculous focus was made in a previously ankylosed joint had definite motion at the knee. There was an extensive subcutaneous abscess which contained thin yellow fluid, and there was evident tuberculous involvement of both bones engaged in the former ankylosis.

#### MICROSCOPIC PATHOLOGY.

Microscopic sections through the joints in which there are epiphyseal foci show defects in the cartilage made at operation. These are filled with granulation tissue, beneath which the bony framework is distorted. The trabeculae are broken down, and the narrow spaces are filled with an exudate made up principally of large mononuclear, lymphoid, and plasma cells. The normal marrow is replaced by the cellular reaction. The microscopic picture was that seen in young granulation tissue, and in the early cases there are masses of culture media which had not been absorbed.

The study of the metaphyseal foci revealed practically the same findings, except that the inflammatory reaction seemed to be more extensive than in the epiphyseal inoculations. The sections show marked reaction in the cancellous portion of bone, with destruction of bony trabeculae by osteoclasts. Along the shaft, above the operative wound, this bone destruction is more marked, and at the same time there is a great deal of connective tissue. In addition to this bone destruction, there is definite new bone formation beneath the periosteum in the vicinity of the operative wound. One finds this most striking toward the epiphysis and in the region of the inoculation. Numerous osteoblasts are found laying

down new bone, and around the trabeculae there is a proliferation of connective tissue. Beneath the periosteum, and infiltrating it, are lymphoid and plasma cells in large numbers. The polymorphonuclear and large mononuclear cells, especially the former, also play an important part in the reaction, there being a large collection immediately beneath the periosteum. In the muscle and areolar tissue one finds fewer polymorphonuclear cells, but a great many lymphoid, large mononuclear, and plasma cells. In the early cases of the *subperiosteal* foci there are masses of necrosis beneath the periosteum, and the inflammatory changes seem to be well localized. The late cases show marked inflammatory reaction, which has extended to the surrounding muscles. Beneath the periosteum these cells are very numerous. The lacunae are wider, not well defined, and the Haversian canals do not have the same arrangement as is seen in the normal shaft of the bone. As in the other experiments, there is a marked proliferation of the connective tissue in the periosteum near the point of inoculation, so that we have bone formation and also bone destruction. The cellular reaction does not differ materially from that found in the metaphyseal inoculations, the mononuclear cells being more numerous than the polymorphonuclear.

In the vicinity of the wound there is a sickle-shaped area of new-formed bone, the point toward the side of shaft, and gradually widening



FIG. 1. EXPERIMENT No. 742.

Metaphyseal tuberculous area of bone destruction in the metaphysis. X, Osteoclasts breaking down the trabeculae. Extensive connective tissue formation.



FIG. 2. EXPERIMENT No. 742.

Metaphyseal tuberculous area of bone proliferation at margin of metaphysis under periosteum. Infiltration of periosteum and muscles by large mononuclear, lymphoid and plasma cells.



FIG. 3. EXPERIMENT No. 742.

High power of Figure 4, showing numerous osteoblasts surrounding trabeculae.

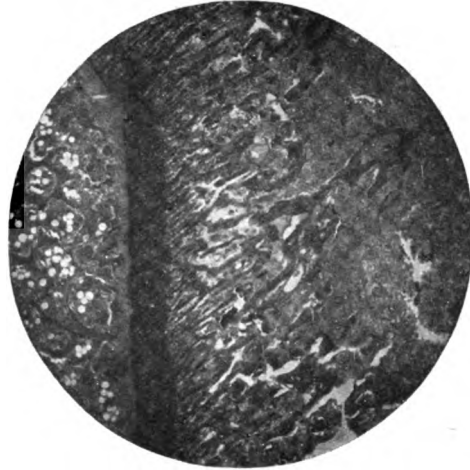


FIG. 4. EXPERIMENT No. 720.

Bovine tuberculosis. Twenty-three days. Metaphysis. Showing marked bone destruction.

as the site of inoculation is approached. This new bone is made up of dense bony trabeculae, with relatively wide spaces lined by large osteoblasts.

#### DETAILED MICROSCOPIC STUDY.

Metaphyseal tuberculosis, bovine type, 48 days. Experiment No. 742.

Section: The section is through the central portion of the knee joint and includes 4.5 cm. of femur and 1.5 cm. of the tibia. In the shaft of the femur is a mass of cells 20 mm. long and 10 mm. broad, extending from the cortex on the posterior side to within 5 mm. of the cortex on the anterior side, and to within 5 mm. of the epiphyseal cartilage. This mass is composed of large mononuclear, plasma, and lymphoid cells, together with a few polymorphonuclear leucocytes. The large mononuclear cells are most abundant. Blood vessels are fairly numerous, newly-formed capillaries are seen. Connective tissue is not seen in the central portion of the mass, but nearer the cortex in the region of the operative wound, it is quite abundant, particularly about spicules of bone.

Many of the bone trabeculae are broken into small fragments. Osteoclasts are present in large numbers, but there are very few osteoblasts, contrasting with the appearance of these trabeculae in a bone of a normal dog of the same age.

There is no cortical bone directly over the mass of cells described above, except at the lower end, and here there is well-marked bone for-

mation, fine spicules surrounded by osteoblasts extending outward from the cortex. This bone formation might possibly be an attempt to repair the damage done at operation.

The periosteum on both sides is infiltrated with cells similar to those in the mass within the shaft, and in some places these cells are found in the muscles and areolar tissue.



FIG. 5. EXPERIMENT No. 783.  
Low power of normal shaft to contrast with shaft immediately beneath subperiosteal inoculation in Figure 2.

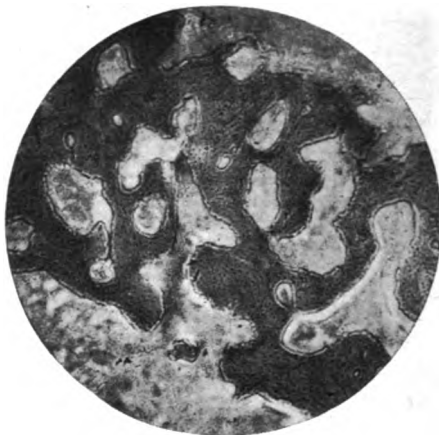


FIG. 6. EXPERIMENT No. 783.  
High power of cortical bone immediately beneath subperiosteal inoculation, showing bone destruction. The large spaces are filled with large and small mononuclear cells.

Subperiosteal tuberculosis, bovine type, 42 days. Experiment No. 783.

A transverse section of tibia: On one side there is a large abscess cavity, extending from the bone into the muscles and areolar tissue. There is complete destruction of the periosteum at this point. The exudate is composed chiefly of polynuclear and large mononuclear cells. Near the bone the polynuclears are few in number, while the large mononuclears are greatly increased, and there is marked proliferation of the connective tissue. The surface of the bone is ragged and broken down. The entire shaft of the bone beneath this area shows marked rarefaction, the wide spaces being filled with large and small mononuclear cells.

In the marrow cavity there is a collection of large mononuclear cells, with some lymphoid cells; the fat being replaced by these cells. This is the case in about one-half of the marrow; the other half appears normal. The shaft of the bone on the opposite side from the abscess cavity is dense and regular and has a normal appearance. The periosteum is apparently normal.

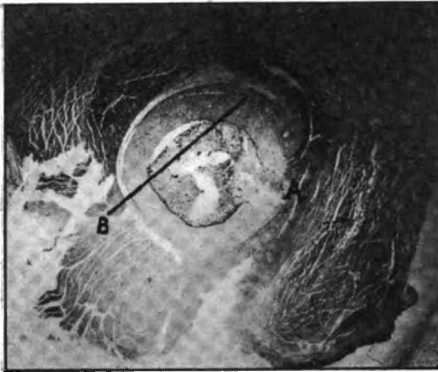


FIG. 7. EXPERIMENT No. 727.  
Subperiosteal tuberculosis of femur.  
Twenty-two days.  
A, Tuberculous abscess.  
B, Sickle-shaped area of newly formed bone under the periosteum.

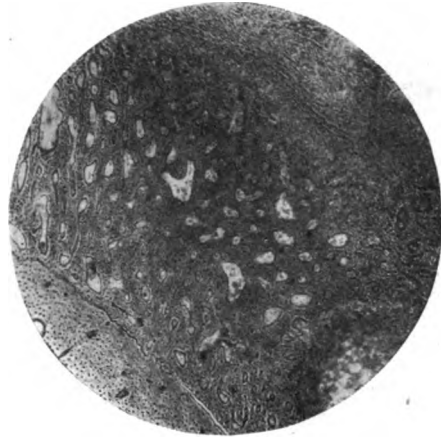


FIG. 8. EXPERIMENT No. 727.  
Subperiosteal tuberculosis of femur.  
Twenty-two days. Higher power of sickle-shaped area of newly formed bone shown in Figure 7 at point B.

Subperiosteal tuberculosis, bovine type, 22 days. Experiment No. 727.

A transverse section of the shaft of the femur: There is a mass, composed of large and small mononuclear cells and polynuclears, extending from the bone out into the muscle for a distance of 5 mm., and half the distance around the bone. At one point the periosteum is gone (presumably the point of operation), and there is but little evidence of bone destruction; on the other hand, new bone formation is rather extensive. There is a mass of newly-formed bone, irregularly sickle-shaped, extending from a point almost opposite the site of operation, and gradually growing wider until it reaches within 3 mm. of the wound. The spaces between the trabeculae are quite wide. Osteoblasts are numerous. This mass of bone lies beneath the periosteum, which shows marked cell proliferation. On the opposite side of the shaft is a smaller area of bone proliferation. In this a considerable number of osteoclasts are also seen.

JOINT SURFACE TUBERCULOSIS.

On opening the joints there was slight excess of free fluid. The joint capsule was thickened, and adherent to the sides of the femoral condyles by a mass of granulation tissue. The synovial surfaces were covered in part by irregular areas of red translucent tissue, in which there were numerous small nodular elevations. Here and there, on the joint surfaces over the bones, there are areas of granulation tissue, and there is



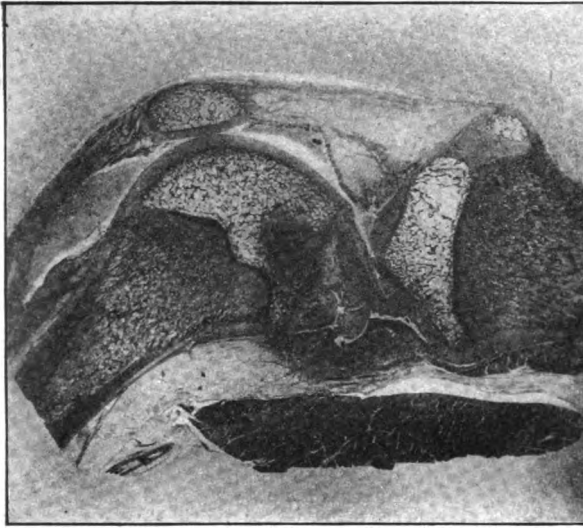


FIG. 9. EXPERIMENT No. 784.  
Epiphyseal focus. Eleven weeks. Human type  
tubercle bacillus.

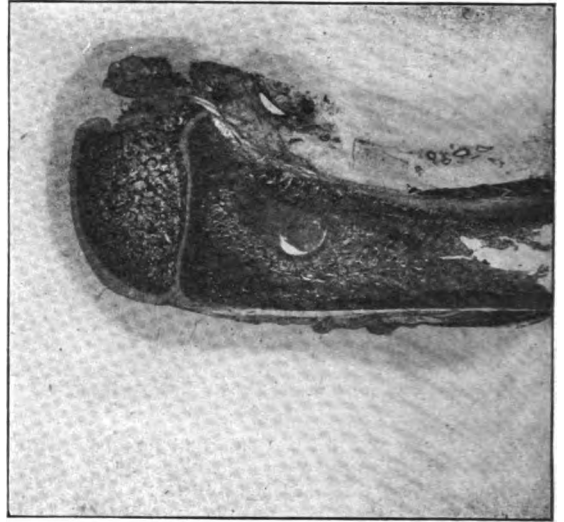


FIG. 10. EXPERIMENT No. 710.  
Metaphyseal focus. Bovine type tubercle bacillus.  
Seventeen days.

evident destruction of joint cartilage in some of these areas. The spaces between the femur and tibia were filled with granulation tissue.

Microscopic study: This shows the synovial membrane to be markedly thickened and infiltrated with lymphocytes and polymorphonuclear leucocytes. The bone marrow of the epiphysis shows little inflammatory reaction, but there are areas where granulation tissue is invading the joint cartilage from beneath.

#### REMARKS.

It seems to us, from these experiments, that it may be considered as possible to establish experimental foci of tuberculosis in any region of the bones of dogs. Our sections show growing foci in the epiphysis, in the metaphysis, in the diaphysis, in the cortex of the shaft, and on the joint surfaces.

We have observed no essential differences in the reaction of the tissues to the human or bovine type of organism.

We have observed that where there are elements that lend themselves readily to new bone formation, then the tuberculous process is characterized, not only by bone destruction, but also by a reaction of prolif-

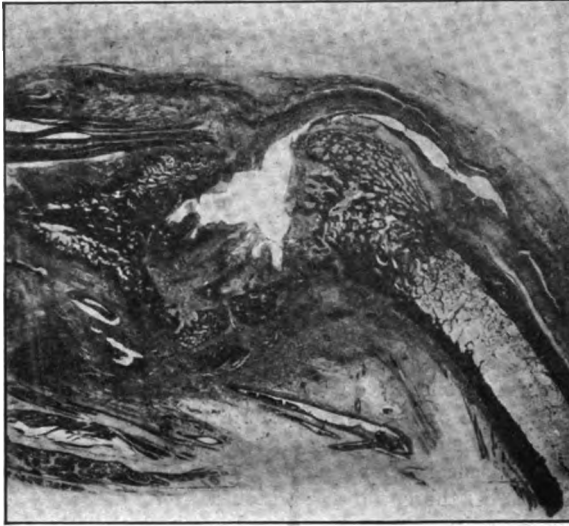


FIG. 11. EXPERIMENT No. 788.

Tuberculous destruction of bone in an ankylosis between femur and tibia. Ankylosis had existed for over one year, and was bony in character. Duration of the tuberculosis seven weeks. Human type of tubercle bacillus.

eration, resulting in upbuilding of new bone. This latter observation is substantiated by the behaviour of the periosteum and subperiosteal layers of bone in the experiments where the focus was implanted in the diaphysis or under the periosteum. In the experiments where the epiphysis or joint surfaces were inoculated, this reaction does not occur, for the simple reason that in these regions the proliferative elements are not found. This observation would seem to bear out the clinical classification of John Fraser (*Tuberculosis of Bones and Joints*, 1914), in that he describes an hypertrophic type of bone tuberculosis which occurs in the shaft of the long bones.

It also seems clear, in so far as these experiments on dogs may lead us, that there are no essential differences in the reaction to tuberculous foci between spongy or cancellous bone and compact cortical bone, except, that in the latter, the element of bone proliferation plays an important rôle.

## DISCUSSION.

DR. CONE: I believe Fraser is right in saying that there must be some hypertrophic change in tuberculous infection. Some years ago, in a case I demonstrated before the Orthopedic Association, where tubercular meningitis followed infection at the diaphyseal side of the femur, there was a considerable outpouring of blood under the periosteum, and there was also a great formation of new bone under the periosteum in the tuberculous area. There was an appearance of acute osteomyelitis with new bone formation. The case was taken for one of scurvy originally, because of this considerable thickening of the gross specimen. Microscopically it showed that there was a development of new bone. This was reported in the May, 1911, number of the JOURNAL.

DR. NATHAN: During the course of the last five years we have been able to produce focal infections in dogs with various microorganisms. I have found that the presence of hypertrophic or atrophic bone conditions did not depend upon the organism, but upon other conditions. With various organisms, such as staphylococci, streptococci and pneumococci, we have produced bone lesions in dogs, in the epiphyses, which in some cases produced atrophic degenerative changes, in others, hypertrophic change as the end-result. I think it depends upon the animal's own resistance and upon the stage when these pathological lesions are examined, as to what you will find in the bone. If the dog recovers, but has rarefaction of the bone, and if he goes on walking, he will have hypertrophic processes there because this is the manner in which the bone attempts to restore normal physiological conditions.

DR. ALLISON: I have not seen in any case of experimental tuberculosis of the bones in dogs any evidence of hypertrophic changes. Clinically this sort of change has been called to attention by Fraser and others, but I have not been able to produce it experimentally. Where it is clinically shown, there is always the doubt of a mixed infection, and a mixed infection is often difficult to prove. I do not regard these cases as pure tuberculosis. I had hoped by these animals to establish or throw some light upon Dr. Ely's theory of bone tuberculosis. What we have found has been a tremendous infiltration of polymorphonuclear leucocytes about the area of infection, and this, I believe, is characteristic of the dog's high resistance to tuberculous infection. Ely's statement that cortical bone is not the site of bone tuberculosis, and that ankylosing of a joint will cure the joint of tuberculosis, is not borne out in these experiments. Apparently in one case we had a breaking down with tuberculous abscess in an ankylosed joint, and in this animal the ankylosis was absolutely bony and the animal had been using it functionally for over a year. Regarding the subperiosteal lesions, I can only go as far as the experiments go. We had established what seems to be tuberculous foci under the periosteum in several instances. My own feeling is that Ely's contention is still open to demonstration. It is a very pretty theory, and it seems to me that it is up to the rest of us to prove that his theory is either right or wrong.

## GIANT CELL TUMOR OF THE OS CALCIS.

BY HOWARD L. PRINCE, M.D., ROCHESTER, N. Y.

THE question as to what giant cell tumors of bone shall be called and where they shall be classified is not surely settled. Most pathologists discuss these growths with a few words and hint at their doubtful status. There is much to be said for Borst's contention that the presence in a tumor of immature cells belonging to the connective tissue group, makes that tumor a sarcoma; since bone is a mature stage of myeloid connective tissue cells, and in these tumors bone is not formed, they should be called sarcomas. Adami admits this but feels that in myeloid tissue there are two distinct groups of cells. First the osteoblasts and osteoclasts; second, the erythroblasts, megalocytes, myeloblasts and lymphoblasts. The former class has to do with bone formation, the latter are mother cells of the red blood cells and leucocytes.

These are two groups of cells of widely different function. There is evidence that under certain unknown conditions any one or all of these cells may react by growth to some particular stimulus. The osteoblast has as its function the building up of bone. It reaches its maturity as a developed bone cell. The osteoclast or myeloplax has as its function the destruction of bone and is, therefore, only secondarily concerned with its growth. Adami feels that it is only from these cells that we may classify primary myelomas. Since the giant cells in these tumors under discussion have the character of mature myeloplaxes, he feels that the term sarcoma is not applicable, that these tumors are true primary myelomas. The non-malignant character of these tumors would bear this out.

The main point for debate lies in the question as to the true character of these giant multinucleated cells. Giant multinucleated cells may be found in many different orders of tumors. Von Hansemann has recognized three classes.

First: Foreign body giant cell found in necrotic or degenerating areas. A good example of this is found in the tubercle. The nuclei are usually situated peripherally in a mass of hyaline or necrotic substance. This arrangement does not hold when the benign body is lateral to the cell plasmodium and not surrounded by it. This class is of leucocytic or endothelial origin.

Second: The parenchymatous giant cell. This class is obtained from the tumor cells proper, by irregular mitosis with lack of cell division. In these cells the nuclei are characteristically irregular in size, some are joined by bridges, some are lobulated. Such cells are

not infrequent in carcinoma and are common in endothelioma. They are usually found in and near degenerating and necrotic areas and, therefore, are not regularly distributed, nor do they form a prominent or characteristic feature of the tumor.

Third: Myeloplaxes. In these cells the nuclei are centrally and rather evenly distributed through the cell substance which does not show evidence of degeneration. The nuclei are regular in size and uniform in density. These characteristics distinguish this last class of giant cells from the first and second classes. They are normally present in red marrow and as osteoclasts in Howship's lacunae. The relation of myeloplaxes to the osteoblasts is undecided. Some regard them as of endothelial origin, while others feel that they are adventitial cells of the bone vessels. Ritter thinks bone building and bone destruction are the work of different stages of the same order of cell. Transition from osteoclasts to spindle cells and fibroblasts has been observed by Pommer and Wegner.

The characteristics of a giant cell myeloma are thus described by Adami. "It grows locally, most often in the marrow of long bones or the jaw; its growth is expansile leading to absorption of the surrounding bone. It is abundantly vascularized. It does not form metastases save in the infrequent cases in which it undergoes sarcomatous modification. It does not recur on complete removal, and as recently shown, to prevent recurrence, it is only necessary to remove the portion immediately involved, with very small surrounding zones. Histologically it exhibits a body formed mainly of short spindle cell elements of fibroblastic type, somewhat irregular in shape, varying from typical spindle to polygonal cells and among these are numerous giant cells of the type described as myeloplaxes." He says there is a tendency to the formation of bony spicules and lamellae in the parts of the tumor where the giant cells are least abundant. This I have not observed. In such parts it seems to me there has been an older connective tissue formation with the formation of small cystic cavities. This I have felt represented the degenerative or healing stage of this tumor.

In 1910, Mallory announced that he felt the tumor in question was a fibrosarcoma in which the giant cells were adventitious, a non-essential feature. He considers them of the foreign-body type. Bloodgood has suggested the use of the term medullary giant cell tumor for this condition. He feels that it is a definite tumor formation, and leans to the osteoclastic origin of the giant cells, although he says in the *Annals of Surgery* for August, 1910, speaking of the microscopical appearance: "Giant cells somewhat of the osteoclastic type predominate

in the picture. Without these giant cells the histologic structure suggests granulation tissue." Hektoen in his book says that some of the giant cells are probably of the foreign-body type. He does not go farther than this.

Barrie feels that there is little ground for calling this condition a tumor. He desires the term "chronic hemorrhagic non-suppurative osteomyelitis." He maintains that the giant cells present are the foreign body type and have no further significance. The origin of the lesion lies in a slight trauma which causes destruction of some of the inner trabeculae with hemorrhage, effusion and interference with nutrition. The trabecular destruction will have a pathologic effect on the venous sinuses that were supported by the trabeculae, causing thinning of the vessel walls with subsequent dilatation, varicosity, transudation and possible rupture. The varicose and dilating vessels, together with the forming granulation tissue about them, are a constantly active factor in the further rarefaction and progressive destruction of the surrounding bone from pressure necrosis. The giant cells are called into being because of the necrotic bone trabeculae. He would have the term "chronic fibrocystic osteomyelitis" replace those of benign bone cysts, osteitis fibrosa, chronic osteomyelitis fibrosa, cystic or solid (Bloodgood); traumatic solitary bone cysts (Felton and Stoltzenburg). This he considers a secondary retrogressive stage of chronic hemorrhagic osteomyelitis. His conclusions are:

First: "That the so-called medullary giant cell sarcoma of bone is, in fact, a regenerative inflammatory lesion without evidence of malignancy.

Second: Owing to the anatomical arrangement and structures involved, slight initial trauma is ample to account for the pathologic phenomena and progressive bone destruction that occurs regardless of any infective process.

Third: The giant cells found in these lesions are neither tumor cells nor tissue builders. They act in the capacity of scavengers.

Fourth: A more simple terminology and classification is needed. The terms at present in use are numerous, confusing and misleading."

In *Surgery, Gynecology and Obstetrics* for July, 1914, he shows numerous radiographs and microphotographs to substantiate his claims. Of the seven cases cited, a consideration of the radiographs and the histories in Cases 4 and 5 would lead me to doubt the diagnosis. I should call these cases chronic localized osteomyelitis or bone abscesses, and expect to find pus with ordinary granulation tissue in them. Unfortunately they were not operated. In Case 2, I feel that the

findings indicate the healing stage of an ordinary chronic bone abscess. The plate of Case 1, to show a lesion in the lower end of the tibia, fails to show the lower end of the tibia.

The answer to the question depends on the character of the giant cells in these tumors. It must be decided whether they are of the foreign body type, or whether they are derived from myeloplaxes. Some observers hold that the myeloplax found in normal bone is merely a foreign body cell formed by fusion of endothelial leucocytes. These are histological questions which must be settled by the histopathologist. Equally skilled men seem to disagree. I can only say that, from my purely amateur standpoint, the giant cells found in the specimens I have studied are not of the parenchymatous type with irregular variable mitotic nuclei, nor does it seem to me that this type of cell enters into the discussion. The myeloplax is an adult cell and one would expect to find in this benign tumor no more evidence of rapid growing mitotic changes than in the ordinary fibroma.

Second: Some giant cells show vacuolations and reticulations of the cell body with both central and peripheral arrangement of the nuclei.

Third: Most answer the description of myeloplax.

That the condition is a tumor seems to me to be borne out by several things.

First: The usual steady progressive increase in size at the expense of the neighboring tissue.

Second: The profuse and much increased blood supply to it.

Third: The lack of reactive changes in the bone in which it is growing.

Fourth: The fact that the growth remains true to type and recurs as a giant cell tumor after an incomplete curettage followed by a violent pyogenic infection.

That the tumor is not malignant and should be treated by local removal is coming to be generally recognized. That it occasionally takes on malignant modification must also be recognized.

The age at which these growths occur varies widely. Bloodgood's cases, with one exception, were over twenty, the oldest was sixty-six. He mentions a case of Davis, aged two and one-half years, although there is some doubt as to the true nature of this case. Barrie's cases are from six to sixty-three. Bland-Sutton says that their occurrence is rare over twenty-five, and on the next page gives a table of eight cases in which five are over twenty-five, one age not given, one twenty, another twenty-three. The last three cases were personal cases. In

my four cases the ages were twelve, thirty-five, thirty-three and forty-one. By far the greatest number of cases I have seen reported are over twenty.

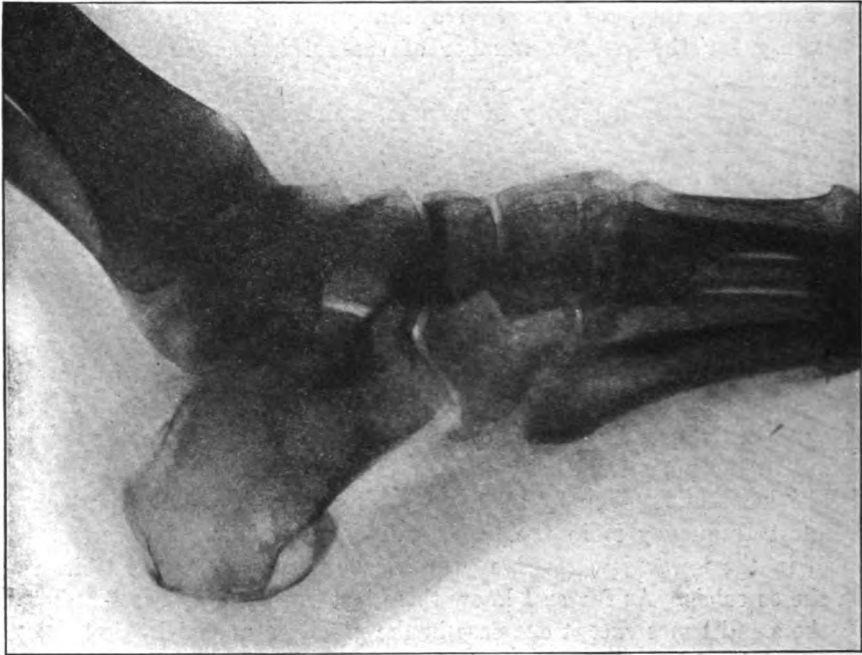
There is usually a history of trauma, which is not severe. Swelling and pain are slight and soon disappear. After a short period of freedom there is a return of slight swelling with pain, usually not severe. This sort of history is continued over months and years. Generally there is a gradual increase in severity of symptoms until the diagnosis is made. Fracture from slight trauma is not as common as in cysts and osteitis fibrosa. The general health is affected only as pain interferes with their well-being. Bloodgood says that the X-ray does not differentiate these tumors from conditions of bone cyst and osteitis fibrosa. It has seemed to me that a very good differential point lies in the markedly greater frequency of the dilated blood vessel openings found in the peripheral bony wall of these tumors.

The location is given by all as in the long bones and the jaw. The greatest frequency is in the tibia, radius and femur. My cases have been in the lower jaw (twelve year old boy), upper end of tibia, two in the os calcis. As far as I know these last are the only cases reported in the small bones except one case in the patella reported by Jones, and pictured by Bland-Sutton. It is because of this rare localization and its possible relation to foot problems that I am speaking of it here.

CASE 1. F. G., male, farmer, 33. General health is and has been excellent. Nothing noted in general physical examination. Teeth show signs of slight pyorrhea, throat slightly reddened, nothing remarkable about tonsils. When first seen in the early part of July, 1911, said that about nine months before (October, 1910) he was hit on the left heel by a plank. There was soreness for several days, which apparently cleared up. A few weeks later began having pain over a localized area on the side of the left heel. No swelling or redness, but very tender. After a few months swelling appeared and has been present intermittently since. The pain has disappeared at times, to reappear, always followed by the swelling. Standing on the feet does not seem to influence the pain or swelling. Is unable to stand without his shoes on. General health is good. Has gained in weight. Says that the pain is always more severe at night. Is an unusually healthy looking man, who walks with a slight limp. There is moderate swelling on both sides of left ankle below malleoli. No redness, some tenderness, some local heat. Suggests osteomyelitis of the os calcis. Radiograph shows mottled condition, posterior part of the os calcis, with atrophy of the other bones of the foot.

The true nature of the condition was not recognized, the foot was put





CASE I. PLATE 1.

in a cast. Thirteen days later seen a second time. Had been more comfortable until two days before when he began having great pain in the heel. Pain was so severe that he removed the cast with no relief. Last night perspired a great deal, then turned cold. No appetite, head aches badly. Looks sick. Great swelling of entire foot. Much redness on either side of ankle with fluctuation questionable, acute tenderness. At this time radiograph showed destruction of the posterior portion of the os calcis, only a shell remaining. Operation disclosed cavity filled with what was thought to be dark red blood clots. At this time there was apparently some doubt as to the diagnosis, which was cleared up entirely by microscopical examination showing typical giant cell tumor.

The next note in the history was August 22d, saying that the wound was severely infected, especially around the external malleolus. An incision below the external malleolus was made and large pus pocket evacuated. On the first of October, two smaller pockets were opened. On October 27th, he was discharged from the hospital with two small sinuses still draining. These sinuses finally healed. On May 18, 1912, a note says X-ray shows bone in good condition. On November 6, 1912, man reported as doing his work apparently in good condition. Foot



CASE I. PLATE 2.

was troubling him not at all except that there was some stiffness. Radiograph (plate 2) was made, and apparently bone was healing in well.

The fact that the growth persisted was overlooked. On October 19, 1913, the following note appears: "Has been walking about without pain, but much handicapped by stiffness of foot. Three weeks ago, without any particular preceding symptoms, a small sore came on the outer side of the ankle, just below malleolus. Has been slight discharge since then." Radiograph (plate 3) was made which seemed to show considerable regeneration of the os calcis, but which, when compared with that of November 6, 1912, shows that there has really been absorption of the bone. From the sinus mouth just below the external malleolus projected some dark granulations which were snipped off and sectioned. Sections showed typical giant cell tumor.

On November 11, a semi-lunar incision passing through the sinus with its concavity upward was made on the outside just below the malleolus. Invading the soft parts along the sinus was found a mass of giant cell tissue, and the os calcis was represented by a shell of bone



CASE I. PLATE 3.

having general character of hypertrophied cortex. The cavity within this shell was entirely filled with dark reddish jelly-like mass of tissue with areas of stained whitish tissue, friable, easily broken up; typical giant cell tumor. This tissue was carefully curetted out. When the walls were thoroughly clean, the entire cavity, with sinus and incision, was thoroughly cauterized with pure carbolic, followed after one and one-half minutes by alcohol. Then the tourniquet was removed disclosing one artery bleeding rather alarmingly, the opening apparently being in the bone on the inner side of the foot. Chiseled fragments into this opening, closed wound carefully and tightly, allowing cavity to fill with blood clots. There was no local reaction, no infection. There was some serum drainage as is so often found after thoroughly carbolicized wounds. The skin edges do not unite as rapidly as they otherwise would. Crutches were used for three months, then began weight bearing. Has continued in fine general condition, is doing his work on the farm, has no pain and little disability, except that due to the stiffness of the ankle, which goes back to his post-operative infection.



CASE I. PLATE 4.

On December 22, 1915, radiograph (plate 4) was taken, which shows the very marked difference in condition over the radiographs which we had before the last operation. It is now easy to see where we should have recognized the recurrence of this tumor much earlier than we did, but the radiographs were not carefully enough studied and we were too unfamiliar with the appearance of the growth.

CASE 2. Mrs. W. C., age 41. Seen first April 12, 1915.

About three years ago, when running across a rough street, turned her ankle. Was very lame for several days. About a week afterward felt a rather sharp burning pain in the heel of her left foot, which disappeared after several days. Since that time has had intermittent periods of pain, with swelling just below the ankle, and lameness lasting at first for several days. Periods gradually lengthened until during the past year they have been fairly constant. Has been treated variously. Had phylacogen about six months. The past three months her ability to walk distances is distinctly lessened, because of pain in the heel and lameness. For the past week or ten days pain in the heel

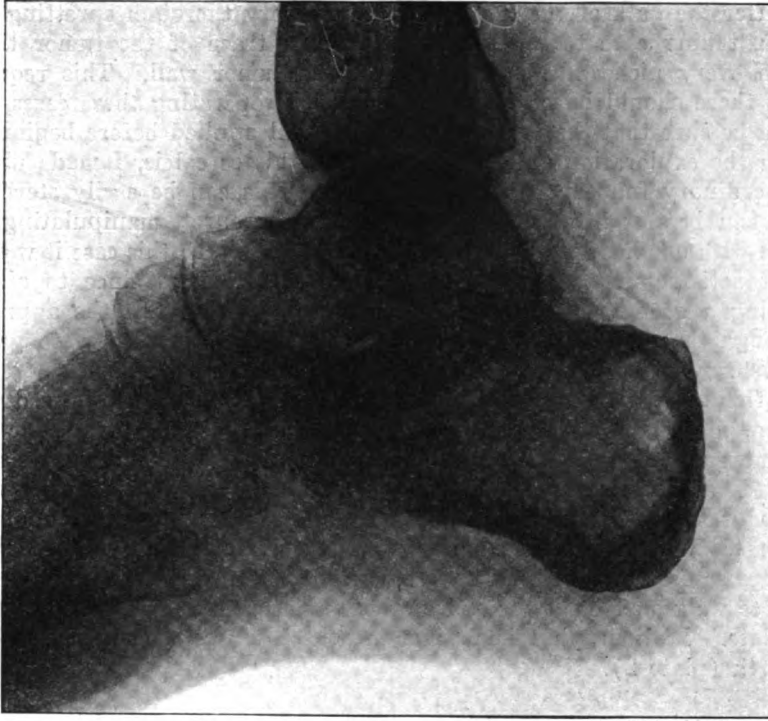


CASE II. PLATE 1.

has not allowed her to bring the heel to the ground, or if she did so, the pain was much increased. Has noticed some swelling on both sides of the foot.

Slender, fairly nourished woman, general examination negative, apical abscess on one crowned canine upper. Tonsils negative. Extremely nervous and says that this trouble is getting on her nerves. Very moderate swelling on both sides of the heel below the malleoli. Seemed as though there was some increase in local heat in this region. Marked tenderness on side to side pressure applied to the os calcis. No tenderness on pressure at the plantar fascia attachment. Abduction and adduction very slightly limited as compared with other foot. Foot held in plantar flexion. Aside from this nothing to be noticed. Radiograph was taken (plate 1).

Stereoscopic radiograph shows that the cancellous structure of the os calcis is almost entirely replaced by tumor tissue. There is a mottled appearance of lighter and darker shadows which is more often noticed in giant cell tumors than in cysts. Through the cortex there are many



CASE II. PLATE 2.

clear holes representing the markedly dilated foramina of nutrient vessels. I believe this is the most characteristic point for differential diagnosis of these radiographs. Cysts and osteitis fibrosa do not call for the blood supply found in these tumors. The cortical walls are of the thinness of paper in many parts. The lack of reactive hypertrophy is noteworthy.

At operation incision was made beneath the external malleolus. It almost paralleled the body of the os calcis with a slight concavity upward. It was carried forward beyond the short peroneal tendon which was displaced upward and forward. Corresponding incision was made through the periosteum which, because of the frailty of the cortex here, was retracted with great care. The cortex here dented easily with the fingers, giving the typical eggshell crackle. Removal of the cortex disclosed a solid tumor mottled red and white. Because of the size of the tumor rather a large area of cortex was removed. Tumor was easily separated from the bone, although so friable that in many places it pulled apart rather than letting go from the bone. There was no lining membrane. Wherever the tumor adhered to the bone, it could be removed easily with a curet.

After the bulk of the growth was out a very thorough curetting was done, taking care to remove every possible trace of the tumor tissue from every niche and irregularity of the tumor wall. This requires that there should be no hemorrhage, and in operating these cases, one must be sure that the tourniquet is very well applied before beginning.

In the exploration and cleaning out of this os calcis, I made use of the ordinary fountain pen electric light. This can be easily sterilized and can be put into a cavity along with the curet, manipulating the light with one hand and the curet with the other. In this case it worked most satisfactorily, and I have used it many times since to aid in getting a good view of the inside of bony cavities. In the approach through the shaft, along the axis of the neck of the femur, to get at an osteomyelitis of the neck in a child, it is of great aid.

After the cavity was as clean as I could get it, it was cauterized very thoroughly with pure carbolic which was allowed to remain for two minutes, followed by the application of alcohol. Tourniquet was removed with no extreme bleeding, periosteum and overlying tissue brought together with catgut, skin tightly closed with silk. Foot put in cast. Wound healed without infection, small amount of serous discharge so frequent with carbolized wounds. Recovery uneventful. Began to walk on foot at the end of three months. No evidence of return to date. Radiograph taken some months after operation shows bone growth (plate 2).

The specimen was sent to Dr. Joseph Bloodgood of Baltimore, who had previously seen the radiograph and thought it a benign bone tumor. He says: "Microscopical section shows giant cell tumor. Giant cells are very numerous. Tissue in which the giant cells are imbedded is what we observe in giant cell tumor, a loose cellular tissue held together by a fine network of connective tissue, intercellular stroma taking the eosin stain faintly. Blood pigment is present in many places. Throughout the tumor there are endothelial lined spaces suggesting blood spaces, and in many of these we find the giant cell. This tumor has all the gross and microscopical characteristics of cellular granulation tissue, but it is the giant cells which characterize the microscopical picture.

In both these cases there has been a fairly distinct history of injury. The extent of the growth has been about the same in the same time. With a history of three years' duration, the second case shows an os calcis entirely occupied by the tumor. The first case at the end of three years shows the same thing. Symptoms in both were alike,—intermittent periods of pain, swelling and limp. These patients both say that they were conscious of a slight pain or discomfort in the heel all the time, but that only intermittently did it become severe. Both had been

treated for many things. One had been strapped for foot strain. In the first case, despite the fact that there was violent post-operative infection, with drainage for a long time, the tumor remained true to type and continued to grow, invading the neck of the os calcis and laterally making the os calcis a mere shell. It is very hard for me to reconcile any explanation except that of tumor growth with this history.

#### CONCLUSIONS.

First: Giant cell tumor cannot be surely placed until the nature of the giant cells which give it its character is determined. If they are shown to be foreign-body cells the tumor is made up of cellular granulation tissue, and Barrie's contention would be correct. At the present time the evidence seems to me to point more to the true tumor character of these growths.

Second: Occurrence is most often in the long bones and the jaw. They may appear in the short bones. The age incidence is generally in the mid period of life, from twenty to fifty. There are exceptions at either end.

Third: Diagnosis can usually be made by the history and the radiographic appearance.

Fourth: The condition is benign. The treatment is thorough, careful local removal with cauterization by carbolic, followed by alcohol. Whether it is necessary to add bone grafts depends wholly on circumstances to be met. I should say that it would not often be so.

Fifth: A local recurrence should not discourage nor lead to amputation.

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#### ROENTGEN DIAGNOSIS OF LUMBO-SACRAL REGION.

BY JAMES K. YOUNG, M.D., PHILADELPHIA, PA.

THE sacro-lumbar region is acknowledged by all to be the most difficult to X-ray. This difficulty is due to the large masses of bone of different density, with their many crossing shadows. To the usual difficulties a special factor is added in the class of cases to be considered, and that is, the great size of many of the patients suffering from pathological lesions in this region. With the improvement in apparatus and technique, many of the lesions in this region can now be successfully diagnosed. The final proof of the presence or absence, the location and extent of the disease or injury in this region, must be determined by



the X-ray. The importance of perfect technique and complete equipment in the making of exposures, and the necessity of training and wide experience in the correct interpretation of the negative, need only be mentioned to be thoroughly appreciated. A thorough clinical examination should always precede the X-ray examination, and definite instructions should be given to the roentgenologist as to the region which is to be studied, as well as to the clinical diagnosis. The X-ray examination should be most thorough, and should include not only the lumbo-sacral region—the one under consideration—but the lumbar spine, and in difficult cases the entire spine, the whole pelvis, including the hip joints, and especially focused pictures of the lumbo-sacral region through a diaphragm compressor.

There are three groups of painful affections in the lumbo-sacral region which require roentgen diagnosis at the hands of the orthopedic surgeon; these are the congenital anomalies, injuries and diseases.

**CONGENITAL ANOMALIES.** In the sacro-lumbar region congenital anomalies have long been recognized and have been fully investigated. Irregular formation of one or both transverse processes of the fifth lumbar vertebra has been frequently noted, and this deformity has been considered a frequent etiological factor in scoliosis. Indeed the irregularities of the deposit and development of the centres of the fifth lumbar vertebra are so variable that the late Professor Thomas Dwight was doubtful what should be considered normal. Congenital anomalies of the body and transverse processes of the first sacral segment are also common, and anatomists differ as to the number of segments present in the normal bone. Defects of this character are likewise responsible for a certain proportion of scoliosis.

**INJURIES TO THE LUMBO-SACRAL REGION.** The injuries to the lumbo-sacral region include crushing of the bodies of the vertebrae, with and without fracture and displacement of the bodies of the vertebrae.

Compression of the fifth lumbar vertebra usually results from a fall, the patient landing upon the buttocks, or from the body being over-flexed or crushed down by a weight from above. The firm support of the sacrum below and the strong ligaments in this region render the fifth lumbar vertebra more liable to crushing than any of the others. If the pressure is not sufficient to cause compression, the intra-vertebral discs may be compressed or injured, or if the patient be a child, the epiphysis may be injured so as to interfere with the growth and produce a wedge-shaped body. Fracture of the transverse processes is not infrequently associated with compression, and the symptoms of this condition have been well described by Hartwell; they include local pain, pain on

rising or sitting down, local tenderness, the limitation of motion, muscular rigidity to avoid pain on motion, scoliosis and pressure pains. Compression of the cord never occurs, because the cord terminates at the lower border of the second lumbar vertebra. The shock is out of all proportion to the amount of injury. These patients often suffer for many years before their condition is recognized, and are treated for many different conditions until their symptoms become chronic. The X-ray shows compression of the fifth lumbar vertebra on one side with or without fracture of the transverse process. If the process be fractured it will usually be observed projecting upward from the fractured surface, and there may be callus at the seat of fracture or later hypertrophied arthritis at the joint and in the sacro-lumbar articulation. Scoliosis is always present, and a secondary compensatory curve will be found above, if the injury has existed some time. There is no listing of the trunk to one side, as in displacement of the sacro-iliac synchondrosis. One shoulder is lowered. Displacement of the bodies of the vertebrae, and especially the fifth, not infrequently occur as a result of the injury; this may be the result of unusual physical labor, the body being held in awkward rigid positions. The rotation of the bodies may occur with or without displacement of the sacro-iliac synchondrosis.

The symptoms of displacement include: spasms of the muscles of the lumbar region; pain in the lumbar region; marked scoliosis with reflex pains, and followed by increasing disability, or complete inability to work. The X-ray shows marked deviation of the spine, with rotation of the bodies and compression of the intravertebral discs. If examined late, marked hypertrophied arthritis of lumbo-sacral articulation will be seen. In some instances ankylosis of the fourth or the fifth lumbar vertebra may be observed.

**DISEASES.** The diseases which occur in the sacro-lumbar region are arthritis deformans, various infections, and malignant diseases. The disease which is most frequently encountered in this region and which deserves the most attention is arthritis deformans. In the milder forms the articular processes show absorption, and in some cases, particularly as the result of injury, considerable deposits of new bone may be found springing from the bodies or the processes or along the course of the torn ligament. The traumatic form is the most common, and is less easily recognized because of its localized character of the deposit. The X-ray shows hypertrophic masses rounded and smooth, bulging from the bodies of the vertebrae, or sharp irregular exudates upon the bodies or articular processes. A rounded localized mass may easily be mistaken for sarcoma by an inexperienced observer. The X-ray picture in the other

forms is not confirmatory until actual bony changes have been evident. When present, the deposits will be seen as sharp or irregular masses upon the periphery of the articular surfaces of the bodies or upon the processes, and this distribution will be general along the entire spine and in the other articulations, especially showing through in lipping of the edges of flat articular surfaces such as the tibia.

Tuberculosis is common in this region, the fifth lumbar vertebra being frequently affected. The rarefaction may be very extensive, including the entire sacrum and fifth lumbar vertebra, and death may occur before the disease has advanced beyond this stage. Later the X-ray shows area of bone destruction and absorption with necrotic islands, with or without sinus or abscess formation.

Osteomyelitis gives a characteristic X-ray picture of rarefaction and destruction of cancellous tissue, the disease being at the time sharply limited by the articular surfaces of the individual bone, as the ilium or sacrum. In the more rapidly destructive forms of osteomyelitis, such as pneumococcic and streptococcic infections, the rarefaction and the destruction resemble tuberculosis, but the necrotic areas are larger, and there are no hypertrophic deposits to limit the process.

Specific osteomyelitis shows more sclerosis and less infiltrating destruction of the bone than occurs in acute pyogenic osteomyelitis. Moreover, the latter spreads more centrally.

Malignant disease is exceedingly rare in the sacro-lumbar region, the upper portion of the spine being more frequently affected. Both carcinoma and sarcoma are usually secondary, although the writer has recorded a case of primary sarcoma of the lumbar vertebrae.

The density of the new growth in the vertebral bodies prevents in a degree the crushing of the body commonly seen in tuberculosis, but there is absorption of the lime salts with more rarely increase in the density in localized areas, with extensive, rapid, and diffuse destruction of new areas.

In sarcoma the ossification progresses in an irregular and ragged way, the effect in the X-ray being not uniform, but spotted, quite different from the regular bony layers observed in chronic periosteitis. The exudate also presents a smoky appearance.

The X-ray in malignant diseases shows an irregular mottled rarefaction of the sacro-lumbar vertebrae without new bone growth, the rarefaction becoming more and more marked as the disease progresses.

Carcinoma is always secondary, the negative resembles sarcoma in appearance, there being less new bone growth and more destruction of bone. The clinical history is here of paramount importance.

## PARTIAL RESECTION OF MOTOR NERVES IN SPASTIC PARALYSIS.

BY C. HERMANN BUCHOLZ, M.D., BOSTON.

THE restoration of function in cases of spastic paralysis demands frequently a long continued treatment by developmental and educational exercise. A greatly defective balance of muscles and an actual contracture of joint may render rational exercise difficult, if not impossible, and may require surgical interference. Until recently, operations on the tendons and muscles were practically the only operative procedures used in these cases, but within the last few years operations on the nervous system directly have been devised in various ways.

Such operations are:

1. The resection of the posterior roots of the spinal cord (Foerster's operation).
2. Operations to cause temporary paralysis by the injection of the nerve tissue (Allison's method).
3. The decompression operation (Scharp and Farrell).
4. The partial resection of the motor nerves (Stoffel's method).

The partial resection of motor nerves has been devised and systematically developed by Stoffel on the basis of his thorough anatomical and clinical studies, although similar operations had been done before by Lorenz and probably others. It was to the great merit of Stoffel to show that every trunk nerve has its definite anatomical architecture which is practically identical for each individual. The knowledge of this architecture, therefore, enables the surgeon to find, at a given place, without difficulty, that nerve bundle for which he looks.

Any new method has to prove its superiority over the older ones before it can be generally adopted. This is a rather difficult task for the operator because it requires a much more exact technic than the old method of tenotomy and myotomy, which it is claimed to surpass in value and which it pretends to replace. It is not surprising, therefore, that the method has been received rather coolly and that it has been rejected by several prominent orthopedic surgeons. Lorenz opposed the method very sharply at the Orthopedic Congress in Berlin, 1912, but granted it, a year later, a certain right of application for the spastic contracture of the pronator muscles, though he did not admit superiority even here.

On the other hand, the method has found a number of ardent friends and supporters, although all of them point out that the time has been rather short to arrive at any definite conclusions.

The claims of superiority of the method have been based chiefly on two factors:

1. The possibility of exact dosage, and
2. The reduction of danger of recurrence.

1. Most surgeons who report their experiences with the operation agree with Stoffel in that the amount of power to be reduced can be estimated with a great deal of exactness, which is not so with tenotomy.

From my personal experience I believe that the dosage can be made fairly exact, indeed, for the muscles of the calf and the back of the thigh, whereas in other regions the difficulties are much greater. But fortunately the conditions in practice are such that dosage is best possible where it is most required, and where it is difficult, it is of no avail anyway. Cases with spastic contracture of the pronator and flexor muscles of the hand and forearm do not often require operative interference unless they are very severe, and then one need not be too cautious. In a case I have operated upon for contraction of the pronators I have removed all fibres from the pronator teres, the flexor carpi radialis and the palmaris longus and there is still a certain amount of pronator spasm present, probably due to the pronator quadratus. I am planning to operate again on this patient for resection of the fibres of the pronator quadratus and some of the long flexors of the fingers. In a case like this it seems to me that the question of dosage is not so very important; after seemingly everything has been removed, one finds that there is still something left.

Conditions are somewhat different in the leg. Here a moderate amount of spastic equinus contracture may be very annoying in walking and at the same time may be strong enough to interfere with the action or even development of the extensor muscles of the foot and toes. My first case belongs to this class. The contracture was not very severe and could be corrected by a moderately strong passive dorsal flexion. Nevertheless, the child walked with a marked equinus and had no active control whatsoever over the extensor muscles. Her mother had always considered the toes to be entirely paralyzed in regard to dorsal flexion, and was greatly surprised to see life return to those muscles some time after the operation.

At the time of the operation I considered this case a slight or moderate one and, following Stoffel's advice, resected about one-third of the motor

supply of the gastrocnemius. This was evidently not enough, and in a similar case in future I should be more radical. Evidently the question of dosage is one that requires much experience and good judgment. But I cannot quite agree with Lorenz when he denies the opportunity of dosage and states an inferiority of Stoffel's method compared with tenotomy in this particular respect.

There is a certain danger of underdosing as well as overdosing the amount of motor supply to be resected. Underdosing leads to an insufficient effect of the operation and, sooner or later, to recurrence. The danger of overdosing does not appear so great, after all, as it might seem at the first glance. Guradze has noticed that after a partial resection of the motor nerves for the flexors of the fingers the extensors were at first not sufficiently counterbalanced by the weakened flexor muscles, but he adds that, after several weeks, the symptoms of paralysis had disappeared and then a correct balance was noted. This is the only remark about overdosing I have been able to find in the literature, and, as it seems, there was no lasting damage reported as resulting from it. In the future I feel inclined to be rather more radical than too cautious.

2. The other factor in which a superiority of Stoffel's operation has been claimed to exist as compared with the tenotomy is the diminished danger of recurrence. It is this factor which has led us to try Stoffel's method. In observing cases which came to the Out-Patient Clinic after having undergone a tenotomy or tendon lengthening for spastic contracture, I was struck by the frequency of recurrence. In one of my four-month out-patient services I counted five consecutive cases of such type showing a partial or total recurrence. In all of these cases the tenotomy had been performed in our clinic and the after-treatment had been done with the usual care and precautions. Similar observations have been made by Hohmann and others who have later adopted Stoffel's method. Hohmann has made a partial resection of the motor nerves in a case where tenotomy had been done three times without lasting result. The explanation of the recurrence in such cases does not seem to be difficult. As Biesalski points out quite rightly, we have to distinguish two elements: a mechanical and a nervous element, and it depends on the individual case which element prevails. If the nervous element prevails, the disposal of the mechanical element, as done by the tenotomy, will often not suffice. The spastic power remains and soon finds an opportunity to work again as the tendon heals very quickly. We admit, however, that by a long-continued fixation in an over-corrected position the danger of recurrence may be considerably reduced. How easily the

tenotomy will lead to an actual deformity, such as pes calcaneus, I am not able to say; friends of Stoffel's operation have pointed towards this danger, but others, especially Lorenz, say that it can be easily avoided.

The question of recurrence after Stoffel's operation depends on (1) the amount of motor nerves to be resected, and (2) the possibility of regeneration.

1. The first point has been already discussed.

2. The possibility of regeneration exists very definitely and several surgeons—Stein, Plagemann and Stoffel himself—have tried to avert it by implanting the central, as well as the distal end of the resected nerves, into the subcutaneous fat tissue. The majority of surgeons who report on Stoffel's operation say that they have not seen any signs of recurrence as yet, though they admit that the time of observation has been too short to warrant any definite conclusions. Biesalski has seen • recurrences as well as successful cases. Vulpius has examined several of Stoffel's first cases some time after the operation and has found that the results were "partially preserved" in those cases where a *complete* resection of the motor supply of the spastic muscles had been done, as in cases of pronator spasm, whereas in cases where a *partial* resection of nerves had been done, recurrence was found "almost without exception." These findings of Vulpius lend further weight to the statement made above that we should not be too cautious.

The method of operation has been described so well by Stoffel himself that I do not need to take your time with repetitions. I will only say that it is a very interesting operation which requires a most painstaking accuracy. One operates on fine nerve filaments which are surrounded by numerous veins, opening of which must be carefully avoided as infiltration with blood causes further difficulty in finding the nerves. The use of an electric needle is a great help for the beginner to differentiate motor and sensory nerves.

In doing the operation for the first time it came to my mind to dispose of the nerves by implanting the central ends into those bundles of the common peroneal nerve which supply the anterior tibial and long extensors of the toes. I have later found out that this had been done before and has even been mentioned by Stoffel himself, although he does not consider this transplantation of any great value and believes that any result seen in such a case may be solely explained by the resection. On the upper extremity I shall not attempt the transplantation of parts of the medial nerve into the radial nerve because of the great anatomical difficulties which are out of proportion to the uncertain value.

I may just add that the wound must be closed very accurately and that in sewing care must be taken not to tie any of the sensory nerves. Several authors have reported neuralgic pains some weeks after the operation in a few cases; we have not had such experiences. Hohmann and others advise to remove the stitches rather late. I believe when we sew the tissues in various layers there is no danger of secondary opening after one week. I have done the operation five times on four patients; two cases of infantile hemiplegia, one arm, and one calf; one case of spastic-ataxic paraplegia in an adult; and one case of Little's disease—both calves. In the first two cases a definite result has been obtained, though not complete enough. The third and fourth cases have been failures on account of insufficient selection; both these cases should not have been operated upon.

#### INDICATIONS.

Turning our attention now to the indications for the partial resection of the motor nerves, we find a large dissention of opinion in regard to regions of the body as well as clinical affections. A number of authors consider this method unnecessary for the lower extremity and want it reserved chiefly for the pronators and flexor spasm of the hand and fingers. Lorenz says that even in such cases he is just as much satisfied with tenotomies, but he admits that this is one region of the body where Stoffel's method is able to compete with the older methods. Kölliker and others, however, give the operation on the nerves preference to that on the tendons for the forearm contractures because of the greater simplicity of the former. Moreover, Kölliker wants to have Stoffel's operation reserved for the cases of hemiplegia, whereas in Little's disease he believes Foerster's resection of the posterior roots to be more valuable, at least in the severe type. In light and medium cases of this disease, tenotomies will generally suffice. From my own experience and judgment I rather agree with Kölliker in that hemiplegia furnishes better opportunities for Stoffel's method. Here the spasms are usually more localized and one or two operations may accomplish a great deal. In Little's disease, if the case is at all severe, a large number of operations on the motor nerves would be required to bring the patient to a condition suitable for exercise treatment. Stoffel reports a case of Little's disease which was greatly benefited by his method, but to accomplish a good result, he had to do no less than seven operations. And each of these is a major operation, though perhaps none quite so difficult and dangerous as Foerster's method.



## CONTRAINDICATIONS.

Stoffel's operation is contraindicated when the disease causing the spasticity has a progressive character. We have come to this opinion by the observations on a single case only, and I am not sure, so far, that I would not try the method again under more favorable conditions. The interesting observations made on this patient warrant a brief description of the case.

T. N., 39 years of age, a skilled mechanic, had noticed increasing weakness, unsteadiness and later almost complete loss of function of his legs for six years. When seen at the hospital he showed a typical marked spastic-ataxic gait; Romberg markedly positive. Marked limitations of dorsiflexion of both feet, worse on the right. Knee and hip motions somewhat restricted by muscle spasm. After careful examination and consultation with Dr. E. W. Taylor, I decided to operate on the right leg. About four-fifths of the motor supply of the gastrocnemius was resected, the proximal end being buried in the peroneal nerve. The leg with the foot was placed on a splint. The wound healed primarily and the stitches were removed on the eighth day. Three days after the operation the patient told me that he could dorsi-flex his foot, which he had not been able to do for over a year. So far so good, but the puzzling thing was that he could also move his left foot, which was not touched at all, not even bandaged. After getting up, the patient was treated for six weeks—too short a time—at the Medico-Mechanical department, and left the hospital somewhat improved, according to his own statement, though he still had a typical spastic-ataxic gait. In spite of the large amount of motor fibres resected, the power of the calf muscles was still good and strong. The difficulty in this case is the lack of knowledge of what we have really accomplished. Why did the left leg react sympathetically with the other? This case, however puzzling it was, taught me at least one thing: That we must under all circumstances become thoroughly acquainted with the condition before we operate.

2. Permanent contractures form another contraindication if they cannot be stretched out even under an anesthetic. This applies for contractures of the muscle itself which is to be weakened by partial resection of the motor supply, but also for muscles nearby, as *e.g.*, the hamstring muscles and tendons, when the nerves of the gastrocnemius are to be resected. I have done this in a case of severe Little's disease and admit that it was a mistake. In planning for Stoffel's operation we must see the way clear before us. When we do a tenotomy and a nerve operation at the same time we deprive ourselves of sufficient judgment. In future,

therefore, I would do first the tenotomy, and later would add Stoffel's operation if a markedly defective balance still exists.

3. Furthermore, the nerve resection would be contraindicated when marked paresis of the spastic muscles exists—not to speak of an actual paralysis. I have come to this conclusion by the observation of a case of Little's disease which I may just briefly describe.

E. W., girl now nineteen years old, who came to the hospital five years ago with a very severe contracture in both hips, knees and ankles. Tenotomies were done of the adductors, hamstrings and Achilles tendon, and the patient was markedly improved, so much so that she learned to walk even without caliper splints. Four years later she returned with a total recurrence of the deformity of the feet. Although I was looking at that time for suitable cases for Stoffel's operation, I decided to do a sliding teno-myotomia of the gastrocnemius according to Vulpius' advice. In exposing the muscle I was struck by its gray-yellowish color, such as we see in degenerated paralytic muscles. In such a case removal of the mechanical element is indicated only, and a resection of motor nerves would not seem to be rational.

4. Stoffel's operation is contraindicated in cases with marked mental deficiency, in cases showing choreiform movement, or in cases of hydrocephalus. I would also rather advise against it in children of too young age, in patients with marked physical weakness or pronounced anemia, and in the presence of social or other factors which exclude or may handicap a careful and thorough after-treatment with systematic developmental exercise. I want to make this point quite clear and may just add that this is also the outspoken idea of Stoffel himself, that the partial resection of the motor nerves is intended to bring the patient's limbs into a condition suitable for exercise treatment, not merely for function on his own accord, but for treatment. There are possibly cases which will enjoy benefit from the operation even without sufficient after-care, as Kofman reports from his clinic, but the full value cannot be derived from this method unless by long-continued, patient and intelligent training of the nerves and muscles. When this is possible we believe that Stoffel's operation is a very useful method.

## TREATMENT OF THE PARALYSIS FOLLOWING POLIOMYELITIS.

BY GWILYM G. DAVIS, M.D., PHILADELPHIA.

THE disability resulting from the paralysis due to epidemic poliomyelitis is caused mainly by the disturbance of the balance of power in the affected parts. The importance of balance in the human locomotor apparatus has been sufficiently pointed out by our fellow member, Dr. Ansel G. Cook. It follows that if we can restore the balance, a large amount of the disability will be removed and the patient greatly benefited. This, therefore, is one of the objects toward which treatment is to be directed. A limb that is paralyzed on one side has its balance disturbed; if, however, the other side is also paralyzed, then, while the balance is restored, still it is so unstable and powerless as to be functionally useless. Therefore, in addition to balance, we should endeavor to restore to the limb stability and power.

For our purposes we may divide the paralytic period into two stages: one, the stage of improvement, and the other after appreciable improvement has ceased. Our really efficient means of treatment are training, apparatus and operations. The first two are not mutilating in character, and are more or less applicable in all stages; but operations, unless done at a suitable time, and unless they are accurately adapted to the individual case, are apt not only to fail in giving relief, but may actually add to the disability present.

During the stage of improvement, most of us will agree that radical operations, as a rule, should be avoided. During this period apparatus may be employed to support the part and prevent the development of deformity, while the restoration of lost power is encouraged by suitable physical exercises and training. When no further restoration of muscular function is visible, say from three years or more after the occurrence of the paralysis, then the stability which up to this time has been obtained by the use of apparatus, may be secured by various operative procedures. The paralysis may affect the lower extremity, the upper extremity, or the trunk. When the upper extremity is affected, I regret our surgical resources are as yet comparatively meagre; of them I am not prepared to speak with any degree of assurance. For a flail shoulder a certain amount of benefit is derived by fixation procedures, such as arthrodesis or silk ligaments. For the wrist, burying the paralyzed tendons of the extensor carpi radialis longior and brevior and ulnaris in the underlying bones enables us to maintain a drooping hand

in a straight and therefore more useful position, without compromising the use of the fingers whose tendons are not disturbed. For the paralysis of the trunk, it is possible that in some cases bone transplantation to impart rigidity to the spine will be of service. In the lower extremity the field is larger and progress has been more marked. The lower extremity is used for two purposes,—support and locomotion,—therefore, in addition to the lack of muscular balance, we have the disabling and deforming effects of gravity to combat.

Beginning with the foot, we find that it possesses two main motions,—first, a lateral motion between the astragalus above and the calcaneum, inferior calcaneo-scaphoid ligament and scaphoid bone below. This articulation I call the sub-astragaloid joint. A paralysis affecting this joint causes the foot to assume a valgus or varus position. In some cases the heel seems to retain its proper relation to the leg, while the foot anteriorly assumes a pronated or valgus position. The displacement in this case occurs between the scaphoid bone and the head of the astragalus. The other motion of the foot is an antero-posterior one and occurs in the ankle joint at the upper surface of the astragalus. Toe-drop and calcaneus are its two favorite deformities. In treating these cases of foot disabilities in their early stage, apparatus is of service. The first requisite is to fasten the foot in the shoe, and the next is to hold the shoe in a proper position. In slight cases a properly modified shoe without side irons may suffice. A stiff shank is essential, and that is secured, if needed, by inserting a strip of steel. To hold the sole of the foot firmly to the sole of the shoe, a double instep strap is used. It is fastened by one end inside of the shoe near the anterior end of the counter, thence passing over the instep to the opposite side, then under a metal loop and back again to beneath and in front of the external malleolus, to be fastened by a buckle. This passes across the instep to and fro over the tongue of the shoe, and draws the heel firmly back into the counter and the sole of the foot, down to the sole of the shoe. The shoe should be of the Blucher type, and snug lacing fixes the foot firmly in the shoe. If the toe-drop is not too marked, the aid afforded by the shoe alone will be sufficient. If there is a moderate tendency to valgus or varus a raising of the outer or inner edge of the sole  $\frac{1}{8}$  to  $\frac{1}{4}$  inch, and even floating the sole and heel out at the side, with, perhaps, the aid of an inside pad to support the arch, will be all that will be required. If, however, the paralysis is more severe, then two (sometimes one) side irons, with a joint at the ankle, are to be added. To aid in correcting the lateral deformity, a pad may be placed beneath or over the projecting ankle, aided, if necessary, by a T-strap passing around

the ankle and the opposite side iron. To correct the toe drop, a single elastic strap up the front is sufficient. To correct the tendency to calcaneus a heel strap running from the heel of the shoe up the back of the leg, to be buckled to the iron band above, is of service in small children. In older children it is difficult to make this strong enough to last, and in them strong elastic or stop joints are used. By these means we have an adjustable appliance, which can be altered at will, and tightened or loosened until the best adjustment is obtained for locomotion.

The knee joint has practically but one motion, an antero-posterior one. When the paralysis is great, the best way to stabilize it is to have a lock joint on the apparatus, and the simplest form is the use of a slip ring. If, as occurs in some cases, a certain amount of movement is permissible, then I have used a stop joint that allows a small amount of back knee sufficient to carry it beyond the dead center, and thus insure stability. To favor the backing of the knee in walking, a heel strap is used which slightly elevates the heel. Personally, I do not put the joint of the apparatus as far back, and use elastic or springs anteriorly to favor extension as much as formerly, although it is sometimes of service.

When the back is weak, a supporting corset or brace is used. If possible, this is not joined to the waist band of the leg braces, but in rare cases it seems necessary to combine the two. In only the worst cases is a lock (slip ring) joint used at the hip.

By means of these appliances the patient is carried along for three years or more, while diligent training efforts are being made to increase the power in the paralyzed limbs. Finally, when convinced that progress is too slow to justify continuing with apparatus alone, the question of operation becomes urgent. If the child reaches the school age, say seven years, it is particularly desirable that apparatus should, as far as possible, be dispensed with. It is also obvious that apparatus is an unmitigated evil in itself, and should be dispensed with if at all possible. There are various measures used in accomplishing the desired object. One is by the transference of power or tendon transplantation; another is by joint fixation or arthrodesis; another is tendon fixation by the method of Codivilla and Gallie; another is the use of silk ligaments; sometimes osteotomy and overlapping of fascia are of service.

Beginning with the foot, the problem is encountered as to how to overcome a paralytic varus or valgus. When the muscles of one side of the foot are paralyzed while the others are healthy, it is a great temptation to transfer some from one side to the other. This is, no doubt, the ideal solution, but in practice, with me, it has not always proven satisfactory. I am not so enthusiastic now as I was a few years ago. To

strike the proper balance has been a matter of considerable uncertainty. Occasionally my cases have turned out all right, but also occasionally I find that in about two or three years a case crops up with a deformity opposite to that for which the transplanting was done. Therefore, for varus and valgus, I am more careful than formerly. Instead of transplanting the entire anterior tibial to the outer side, I now sometimes split it and add other procedures, such as burying the paralyzed tendons or else do an arthrodesis of the subastragaloid joint. In some few cases where the anterior portion only of the foot is involved, arthrodesis of the head of the astragalus and scaphoid alone is done. The use of silk ligaments has not been very satisfactory. As yet the most reliable procedure has been a fixation of the subastragaloid joint. This operation, which I call subastragaloid arthrodesis, consists in digging up the contiguous surfaces of the astragalus above and the os calcis behind and scaphoid in front, through two incisions, one below and in front of the internal malleolus, and the other below the external. This operation I have been doing over six years, and thought was original, but possibly Nieny (*Arch. f. Orthopädie, Mech. u. Unfallchir.*, Bd. 3. S. 60) may have antedated me. By this operation, which can be performed on patients from the age of six or seven upwards, one can obtain in a few weeks a perfectly solid foot that seems to last indefinitely.

Transplanting the peronei into the os calcis and the extensor longus hallucis into the neck of the first metatarsal bone (Forbes) has been found to be satisfactory; the end of the tendon is always fastened through a hole in the bone. To correct the foot-drop, burying the anterior tibial and peroneal tendons (if paralyzed) promises to be satisfactory. It is preferred to the operation of Putti or the use of silk ligaments. In cases of calcaneo-cavus the operation of horizontal transverse section is preferred.

This operation, which the writer described in the *AMERICAN JOURNAL OF ORTHOPEDIC SURGERY*, is done as follows: An incision an inch and a half long is made beneath the external malleolus. The peronei tendons are lifted out of their sheaths, and if not paralyzed, may be cut and transplanted into the os calcis either through a separate incision or by lengthening the incision upwards and also posteriorly. Then with a curved elevator, the soft tissues are pried up from the bones posteriorly and anteriorly over the tarsus. With a flat, narrow gouge the adjoining surfaces of the os calcis and astragalus are thoroughly dug up and the chips allowed to remain. Another incision is made below the internal malleolus, and the tendon of the posterior tibial loosened and held aside. The soft tissues behind the internal malleolus and anteriorly over the

tarsus are raised up with the periosteal elevator. The flat gouge is then introduced between the astragalus and sustentaculum tali posteriorly, digging up their articular surfaces, and then carried in a straight line forward through the head of the astragalus and upper part of the scaphoid. The soft tissues having been freely detached, and the chisel gouge having been freely thrust through from one side of the tarsus to the other, a complete horizontal transverse section of the foot just below the malleoli has been made. The foot is then forcibly thrust back about 2 cm., or  $\frac{3}{4}$  inch, and the two wounds closed. The foot is encased in plaster, in which a foot board is incorporated and placed in slight extension, with the sole absolutely level, without any over-correction to either side. It ankyloses with the foot in the exact position in which it has been placed, and when healed eliminates all tendency to lateral motion and with the ankle farther forward over the arch. The cavus deformity, although not entirely removed, is sufficiently lessened, and the ankle joint does not have its motion seriously interfered with. This operation does not shorten the paralyzed leg, and keeps the foot in position without the necessity of the use of apparatus. Ordinary foot-drop can be controlled by burying the tendons, but in those cases in which instability of the knee is marked, and in which some power of the hamstring muscles is retained, then in order to throw the knee back, an arthrodesis of the ankle, with the toes slightly pointed, is of service. In these cases, to favor stability in extension, we frequently do an osteotomy of the lower end of the femur, making a back-knee, and incidentally correcting the knock-knee so often present. In order to encourage fixation of the knee when the quadriceps is paralyzed, success has been achieved by transplanting either the sartorius, or biceps, or internal hamstring tendons to the patella, but if there is only one hamstring muscle unparalyzed, we hesitate to transplant it to the patella for fear of a genu-recurvatum developing later. As yet I am not prepared to advocate arthrodesis of the knee joint.

When there is a persistent outward rotation of the foot it is corrected by the operation described by the writer in the *AMERICAN JOURNAL OF ORTHOPEDIC SURGERY*.

It consists in strongly inverting the foot, making a longitudinal slit over the greater trochanter and sewing the anterior free edge of the fascia lata to the posterior surface of the trochanter, thus holding the leg in its inverted position. When there is paralysis of the glutei muscles associated with that of the quadriceps femoris and perhaps of the back muscles, possibly of both sides, then it may perhaps be allowable to do an arthrodesis of the hip. I have recently tried one such case, but it is rarely necessary to resort to it.

By the various means here detailed, as time proceeds we are enabled to eliminate the use of apparatus, and substitute the stability derived by operative procedures in nearly, but not quite all, of our cases.

As will be seen, arthrodesis with me is a favorite measure. It can be done with little danger, and if it fails it does not seriously prejudice the case, and can be corrected and improved by a subsequent operation. In doing it, one does not attempt simply to remove the adjacent cartilaginous surfaces, but rather ploughs the surfaces up with a flat gouge, leaving very irregular roughened surfaces, without removing the bony and cartilaginous chips. The subsequent reaction and repair welds everything together in one solid mass.

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### TORTICOLLIS—A REVIEW.

BY ARTHUR L. FISHER, M.D., SAN FRANCISCO.

My reason for presenting a paper on torticollis is that I believe that there is no adequate consideration of the subject in the English language. Most of the study of this condition has been done by foreigners, and it is natural that their reports should appear in their own language.

In English we use the terms torticollis or wry-neck. In German it is called *der Schiefhals*,—the Germans also use the terms *caput obstipum* and torticollis. The French use the terms torticollis, *cou tors* or *cou tortu*; in Italian it is *torticollo*. A great many other terms are found among the older writers on this subject, but none of them has any considerable vogue.

Historically there are a few points worthy of mention. According to Steyerthal and Uhl the term torticollis was first used by Rabelais (1495-1553). He used the form tortycolly. In its present form it was first used by Scarron (1610-1660) in a French verse.

Muscular wry-neck was described by a number of writers in the seventeenth century, as by Isaak Minnius, 1641; Van Roonhuysen, 1680; and especially by Nicholas Tulp or Tulpus, 1650. Nicholas Tulpus is the demonstrator in Rembrandt's famous picture "The Lesson in Anatomy," or as it is often called, "The Anatomist." Tulpus described to a certain extent the anatomy of the condition and reported an operative case. In the eighteenth century there appeared many articles, especially by Bell, Bundel and Rettig. In 1737 it formed the subject of an inaugural dissertation at Tübingen by one Von Jager.

Like so many of the ordinary deformities, several of the world's great



men are said to have been afflicted by torticollis, *e.g.* Tiberius, Alexander the Great, and Charles the Great. However, there is no authenticity to any of these reports.

*Frequency.* Torticollis is not a frequent deformity. Hoffa, in tabulating 1444 deformities, found wry-neck to form 0.49%. According to Dollinger's figures, it forms 2% of all deformities. Rosenfelt, who gets his figures from Hoffa and Schanz, finds it to be about 1% of all deformities.

The right side is slightly more frequently affected than the left—according to statistics from 10 sources, 277 on the right to 222 on the left. According to the figures of the same ten people, sex stands 284 males to 286 females, but there is considerable variation in the individual figures.

*Normal Anatomy.* Ordinarily we think of the sternomastoid as a muscle running from the mastoid process downwards, inwards, and forwards, as one fleshy belly that divides into two below, one portion being attached to the upper part of the sternum, and the other near the inner end of the clavicle. Ordinarily the clavicular portion is the larger. Variations in the muscles occur. Sometimes there is no division in the belly of the muscle,—it extends as one from the mastoid to the sterno-clavicular region. On the other hand, two distinct muscles may be present, one running from the mastoid to the sternum, and the other from the mastoid to the clavicle. In certain of the mammals this is a normal condition. The space between the posterior border of the sternomastoid and the anterior border of the trapezius is very variable, and there may be muscle fibers continuous throughout, making a sort of third muscle or uniting the trapezius and the sterno-mastoid.

Blood supply of the muscle is also variable. The two main sources of supply come from the superior thyroid and a special muscular branch from the external carotid. However, there may be branches from the posterior auricular—parotid—lingual or occipital arteries; in fact, from any branch of the external carotid. Besides this there is frequently a secondary smaller blood supply in the lower part of the muscle that comes from the thyroid axis—either from the transversus coli or the supra scapula. Kempf found this lower supply in four out of six infant cadavers studied. In general, however, the majority of the vessels enter the upper part of the muscle and run downwards and parallel to the muscle fibers. The upper part of the muscle has a much more abundant blood supply than the lower. The vessels are either anatomical or functional end arteries—they do not anastomose one with the other.

The veins, in general, follow the course of the corresponding arteries.

The nerve supply is from the eleventh cranial (spinal accessory), and from branches from the cervical plexus.

*Function of the Sterno-mastoid.* Contraction of the sterno-mastoid on one side flexes the head laterally towards the side on which the muscle is acting—at the same time it raises the chin and turns the face towards the opposite side. When the muscles on two sides act together, the head is somewhat raised as the points of insertion are posterior to the axis on which the head rotates. When the head is held still the muscles raise the clavicles and act as accessory muscles of respiration.

*Pathological Anatomy.* The gross pathology of this condition has been known for a great many years. Tulpus, Van Roonhuysen, and Meerkreen described it in the seventeenth century and made it very clear that there was a change in the sterno-mastoid that made it seem as if the muscle had been converted into a tendinous band. In fact, Meerkreen so described it. The shortening of the muscle, as compared to its fellow on the opposite side, was also noted.

Bouvier was the first to describe the microscopic findings in a case from autopsy. Since then a great deal of time and energy have been devoted to this condition. Bouvier stated that the muscle substance had lost its proper character,—small masses of muscle could be seen showing longitudinal striations,—but that the cross striations were lost. The muscle substance was greatly reduced in amount.

The gross pathology is described the same by all of those who have worked upon the subject, and the microscopic appearances are described by all in pretty much the same manner, but the interpretations of the microscopic findings vary very greatly,—frequently due to preconceived ideas of the etiology of the trouble. The etiology of the condition and the microscopic appearance of the muscles are wrapped up in each other—so intimately connected that it is rather difficult to speak of one without the other. I shall try, however, to give some idea of the pathology first and leave the various interpretations of the microscopic pictures until I consider the etiology.

All of the observers describe the degeneration of the muscle and an irregular connective tissue growth. Hadra, Luning, and Schulthess consider it a fibrous degeneration that does not follow any acute process, but as some abnormality that arises *in utero*; whereas Kader, Volkmann, and Mikulicz believe that the changes follow an acute process. Koster, in 1895, showed some sections from the sterno-mastoid of a 27-day-old child, which consisted of white, hard, fibrous nodules and did not show any muscle fibers at all, as would be the case had it followed a trauma to the muscle. Outside of these nodes or nodules there were muscle

cells, but they were altered in their striations. He believed the process to be a degenerative one, and applied the term fibrous dystrophy.

Kader has studied the subject carefully and gives some interesting plates in his article. He followed Mikulicz' idea that the process was a degeneration following an acute inflammation, and in this sense called it an interstitial myositis. Others have used the same term, but believe it to be a chronic process from the start, and use the term interstitial myositis in that sense.

Kader describes muscle degeneration and the growth of connective tissue around the degenerated muscle. He also describes fibrous thickening, not only in the sterno-mastoid, but in the trapezius and extending to the other muscles of the neck, as the platysma, and the scaleni, and also to the sheath of the vessels. He also describes the lymph glands as being enlarged in a large proportion of the cases. He calls this the resting stage. Opposed to this resting stage he finds what he calls an active acute stage in which the muscle fibers are swollen and irregular, the plasma cloudy,—partly showing absence of nuclei and partly showing an increase in the nuclei of the sarcolemma. The striations are practically gone. There is small cell infiltration in the connective tissue, and also in the sarcolemma itself. In such places there is a profuse new formation of blood and lymph vessels.

Volcker considered it an atrophy of degeneration from the start, and in addition to what others have described, notes particularly the absence of blood and blood pigment.

Kempf says that in order to assume an interstitial myositis, as Kader does, the active roll of the connective tissue must be shown, that is, the active growth of the connective tissue must be the primary, the effect on the muscle must be the secondary, effect; that anatomical pictures of muscle diminished in all its diameters must be shown accompanied by active proliferation of connective tissue. This he fails to do.

Schloessmann, in 1911, revived the entire subject. He had the opportunity to study the muscle from very young infants,—a particularly advantageous thing, as the longer the condition exists the more difficult it is to judge of cause and effect in interpreting the anatomical picture. He found many punctiform hemorrhages in the muscle that could be seen shining through the perimysium. He also found a condition that he interpreted as a primary degeneration of the muscles with secondary connective tissue growth, that is, in places where there was absolutely no evidence of connective tissue new growth there was beginning degeneration of muscle, and this degeneration of the muscle he could follow through all stages to its complete disappearance and its substi-

tution by connective tissue. Schloessmann states that in none of his cases could there have been any very great trauma at birth, as he did not find any corresponding lesion. The hemorrhages he found, he believes were due to the forceps (anatomical, not obstetrical), and possibly to the birth process itself. He does not believe that they stand at all in the causal relation to the muscle degeneration, because they do not occur in the same neighborhood. The same is true of blood pigments that he found in some of his specimens. He believes that the cause of the muscular degeneration lies in ischaemia of the muscle (considered under etiology).

To sum the matter up, the best evidence seems to show that the pathologic process is a primary degeneration of the muscle fibers followed by an increase in the connective tissue.

*Etiology.* This is the most interesting phase of the entire subject, and one that has caused an enormous amount of controversy, and as Albert Bauer remarks in a *sammelreferat*, is one that is "*noch unklar*."

There are four main ideas as to the origin of wry-neck:

1. Traumatic.
2. Infectious.
3. Intrauterine origin.
4. As a most important subdivision of intrauterine ischaemia of the muscle.

The traumatic theory was first definitely formulated and announced by Stromeyer in 1830, and held its sway for about fifty years, and was accepted without comment by nearly all the men whose names were great in surgery during that period. He stated that the cases arose following a difficult labor,—one with abnormal position or with forceps extraction. He cited four such cases,—tearing of the muscle with swelling, hematoma and gradually fibrous repair, leading to hardening of the substance and shortening of the muscles. The first to contradict this idea was Petersen, in 1884, who announced that Stromeyer's idea could not be right; that wry-neck never came from a tear in the muscle, and that the whole idea was most improbable. Following this, there appeared many articles on both sides of the question,—most of them upholding Stromeyer. Among others, it is interesting to note one by Volkmann, interesting in view of the ischaemic theory of origin.

Without going into particular cases and facts produced by each writer, the main arguments advanced in favor of the traumatic theory are:

1. It occurs in cases of difficult birth, especially breech presentation and forceps cases; many authors report a large percentage of such cases.

Mikulicz says that in breech cases the cord gets round the neck and the child makes violent respiratory movements, thus tearing the sterno-mastoid. Kustner showed that the sterno-mastoid is not easily injured when the head is held straight, but if the head is rotated then the muscle can be more easily torn, and he stated that this might happen in normal births. This was refuted by Kader, who stated that he could get no hemorrhage.

2. A certain number of cases in youth and in adult life have been observed in which injury to the sterno-mastoid has been followed by wry-neck.

3. Hematoma. Observed in some cases (usual clinical observations), but not in all. There is swelling of variable size, no fluctuation; skin sometimes reddened. Contraction of the muscle brings out the swelling.

4. The histological picture (muscle degeneration—increased connective tissue and blood or blood pigment).

Against these arguments are:

1. The small percentage of injury to the sterno-mastoid followed by wry-neck; also the variability in the size of the hemorrhage. Spencer found that about 5% of the cases occurred in still-born children, and also the many different kinds of injury cited.

2. The negative outcome of all animal experiments (subjecting the muscle to various traumata, as cutting the muscle across, multiple incisions, etc.). But these experiments cannot be valued very highly on account of the great difference in the conditions.

3. Injuries to muscles do not heal with shortening. Badelaben, Billroth, and Maydl experimented in 143 cases,—ten of the sterno-mastoid,—only once getting shortening. Also the vast number of clinical experiments made daily by surgeons shows this same thing.

The proponents of the traumatic theory hold that there is a difference between the muscles of the young and those of older individuals, and further, that children show a certain instinct to hold the head to one side, and that this allows the muscle to shorten (Koenig, Vonch, and Volkmann).

4. The fact that after myorrhesis there is no recurrence of deformity, as shown by Lorenz in wry-neck and in congenital dislocation of the hip (no adductor contraction).

5. The histologic picture. The work of many careful investigators (Koster, Kempf, Schloessmann, etc.) shows no evidence of trauma.

*Intrauterine Origin.* This is the oldest idea concerning the origin of wry-neck and was first advanced by Van Roonhuysen, 1668-70. Busch also stated that it was due to abnormal position *in utero* (narrow pelvis

holding the uterus and foetal head in antiflection). Stromeyer also said it might be due to intrauterine pressure and cramp of the muscle in lateral position. Fischer, in 1880, saw seven children with wry-neck in one family.

Petersen in his famous article gave seven reasons why the trauma could not be the causative factor.

1. No reported case could stand criticism.
2. Clinical observation and animal experimentation are against it.
3. The presence of intrauterine shortening of the sterno-mastoid is known and proven.
4. From clinical observation and animal experimentation it is known that continuous or lasting approach of the origin to the insertion of a growing muscle causes shortening. He experimented with the gastrocnemius of rabbits.
5. The greater frequency on the right side and also the frequency in breech presentations speak for some abnormal relation to the amnion.
6. (He repeats.) Stromeyer's theory is not so confirmed that it can answer attacks upon it.
7. That the wry-neck is never the fault of the obstetrician.

Several positive factors, however, have been adduced in favor of the intrauterine origin.

1. There are many congenital cases reported where there is no special birth trauma: Whitman, 32 out of 264 cases; Redard, 18 out of 70 cases.

2. The combination of wry-neck with other congenital deformities, such as high-shoulders, congenital dislocations, hare-lip, hypoplasia of genitals, club-foot, subluxations of the hand (Madelung's deformity), defects in radius, facial paralysis, defect in the pectoralis major, etc. It is most frequently combined with congenital dislocations and high shoulder-blades.

3. Hereditary influence, as evidenced by family disease. Most frequent relationship is that of mother and daughter, but all relationships have been observed, including that of father and son. (Question of true heredity or pressure.)

Phocas (*Rev. de Orth.*, 1894) says that it is due to fetal rachitis (but the evidence is not good).

4. The histological findings as already noted.

5. Asymmetry of the ears caused by pressure, particularly a little groove in the lobe, which could not be caused by birth trauma.

Volker found a fetus taken in a Caesarean section, with a right-sided wry-neck, and its ears pressed forward and the little groove in it. Also

with the right foot in varus and the left foot in valgus position—all due to pressure.

*Ischaemic Idea.* Volker was the first to advance the idea that wry-neck was due to ischaemia of the sterno-mastoid. He observed a notch in the ear on the affected side. This notch he concluded was caused by pressing the head laterally against the shoulder, and turning the lower part of the ear upwards. The pressure of the head against the shoulder also shut off part of the blood supply of the sterno-mastoid, particularly part of the arterial supply, and prevented return of venous blood. The muscle is better supplied with blood above. The central pressure is just over the main branch of the vessels; there is not a complete shutting-off, but a lessened arterial supply and venous congestion, as in the ischaemia of the forearm, described by Volkmann. Birth acts as a sudden release of the pressure, then swelling occurs, as when the splints are removed, as in the case of Volkmann's paralysis, and it is this swelling that is called the hematoma. (Kersting tried, on a baby cadaver, to imitate the position and then inject the vessels. He found only a small branch of the occipital was compressed; the other arteries were all right.) Kempf also believed in the ischaemic factor. He found a constant artery from the thyroid axis, so he believes that the shutting off the blood supply from above brings about a diminution, not an actual stoppage of the oxygen and foodstuffs. The intracellular chemistry is changed.

Maass believes that the ischaemia is not due to pressure, but to stretching, particularly stretching with rotation. He believes that a lengthy stretching with rotation and abduction would lead to complete degeneration of the muscle.

Ritter believes in ischaemia and simultaneous injury. He came to this conclusion on account of the effect on the vessels in three cases occurring in the extremities.

Nové-Josserand and Viannay made anatomical studies and found that the vessels above are free and run in a more or less transverse direction. This is true for the upper third. In the lower two-thirds the supply comes mainly from the thyroid by branches running superficially and parallel to the muscle fibers. They are anatomical or functional end arteries. Trauma or pressure either affect them. In the wry-neck position they are only slightly filled. (True also of the carotid.) On the other side they are unaffected.

*Infectious Theory.* Volkmann and Vollert, from a study of nine cases of wry-neck, seem to think that it followed an infectious process, and called it a myositis fibrosa. Mikulicz, in 1895, considered it to be a

chronic inflammatory process and considered the above name a good one. In 13 cases he found glandular involvement definitely connected with the muscle. Three were definitely tuberculous, and seven hyperplastic. Kader reports a case following diphtheria and two others with myositis arising in the course of acute infectious fevers, later followed by wry-neck. Kader believes that the infectious process takes place in a previously injured muscle,—torn fibers or compressed ones, etc. He follows Krasky's idea on muscle regeneration, that the fibrous tissue outgrows the muscle and more and more causes strangulation of the muscle, causing finally a hard, fibrous band. The source of the infection can come from any other portion of the body, as the mouth, intestines, etc. (All inoculation experiments have been failures. Voleker, Schloessmann, Kallenburger, etc.)

Hildebrand and von Noorden have reported cases of infection after injury, and cases are reported following typhoid, meningitis, whooping cough, mumps, etc.

Disturbances in the nervous centers are supposed by some to exaggerate any of the other causes, particularly the ischaemia. Peripheral nerve influence has a certain effect, particularly the spinal accessory. Kader has reported a case of pain in the brachial plexus, relieved by tenotomy of the sterno-mastoid. Gallaverdin and Savey have reported a case of a man sixty years old who had wry-neck since infancy and had an atrophy of the anterior horn cells on the same side. (*Post hoc* or *propter hoc*?)

*Secondary Skeletal Alterations.* Accompanying, or rather following, wry-neck are certain secondary skeletal alterations. The older authors, Dupuytren, Bovier, *et al.*, noted scoliosis. Nikoladoni and Hoffa have commented on the scoliosis thus: The dorsal scoliosis is not dependent on the cervical, but arises in this manner; that the weight of the head is over to the healthy side, and consequently over that side of the body axis; consequently again on the healthy side of the thoracic column, which on this account becomes scoliotic, with the convexity on the affected side and the concavity on the well side. Lorenz, however, has made a more careful study, and differentiates the scoliosis into two groups. The first shows a high-grade deformity which, contrary to expectation, is easily corrected. The second group, with not such a great deformity, is much more difficult to correct. The first group, the representative of which Lorenz gives as a right-sided wry-neck, has the entire head drawn to the right side, and the cervical vertebrae drawn to the right. There is, therefore, a cervical scoliosis, with the convexity to the left. The left shoulder blade is about three times as far from the dorsal



spine as the right, and is much more prominent. There is an increase in the bending forwards of the angle of the ribs of the left side. There is a left-sided dorsal scoliosis (convexity to the left), and very little curve in the lumbar region. The curves in the cervical and dorsal region are continuous.

In the second form the head inclines to the affected side, but is dislocated as a whole to the unaffected side. The curves thus produced are different. There is a cervical scoliosis with the convexity to the unaffected side, and a thoracic curve with the convexity to the affected side. In the first case the curves are in the same direction, in the second case in the opposite direction.

Lorenz considers the second type as a compensatory scoliosis, comparable to habit dorsal scoliosis,—the cervical scoliosis is compensated by a bending in the occipital-atlantal joint. He applied the name occipital compensation of cervical scoliosis.

The first form is a cervical scoliosis without occipital compensation. The second form is a primary cervical scoliosis, with a partial compensatory occipital scoliosis and also with compensation below. Joachimsthal says that there may also be some chest and pelvic changes along this line.

Asymmetry of the skull develops, and has been the subject of many careful studies that I do not intend to enter into in detail here. Volcker points out a very interesting relationship. He shows that the sagittal plane of the head is curved, the radius of curvature being about two meters in a well-developed case, and all the points that should lie on a vertical plane rest on one of these radial planes.

In explanation of asymmetry, Stromeyer says that it is due to a lessened circulation. Little and Bosch say it is the atrophy of disuse, as this side of the face is not used as much for facial expression, and perhaps for mastication. Bouvier and Guerin say it is due to the compression of the carotid as they found it at autopsy. Many of the French have accepted this view, as it is supported by some experimental evidence. However, Volcker and Kader show that the carotid is frequently larger than on the opposite side, and Witzel has shown that atrophy following ligation of the carotid is different from the asymmetry of wry-neck. In wry-neck the lateral axis is longer and the longitudinal axis is smaller on the affected side of the face.

Nikoladoni placed the cause of facial asymmetry in the fusing of the centers of ossification of the occipital bone, and the differences in pressure thus produced are transmitted forward to the face, causing lessened growth.

Witzel says the muscles of the concave side are less stretched than those of the convex, therefore the muscles of the convex side press more towards the vertebral column and limit its transverse growth; at the same time they pull the chin downwards and backwards. Hoffa and Mikulicz agree with this in the main; the latter says that not only the muscles on the affected side, but on both sides, must be held responsible for the cervical scoliosis, because it is the resultant of forces acting on both sides. Lack of function of the neck muscles can produce facial asymmetry, as observed by Charcot and others. Volcker says it is due to intrauterine pressure. Kader says it is due to several factors,—the result of the pull of all of the muscles inserted into the skull and of the position of the center of gravity of the brain, it being on the affected side.

Plexus paralysis is one of the less common secondary consequences of wry-neck, and is due to the pull on the plexus from the head or the arm, and there must be a certain rather high grade of deformity before this can occur. It may occur at birth or arise later. Mikulicz had a case where there was a neuralgia of the plexus that was cured by tenotomy. Lorenz had torn the plexus in an attempted forcible correction of wry-neck.

*Ocular Defects Accompanying Muscular Wry-Neck (not causative).* Koenig and von Hubscher observed symmetrical narrowing of the visual fields, on the right in left-sided wry-neck. Von Hubscher says that the visual axes are in line with the plane of the body and not with the plane of the face, producing a squint.

There are cases reported where, following operation, the visual fields have become normal. In several other clinics the visual fields have been studied and found normal. Nystagmus is not present in this form of wry-neck.

Other occasional finds are:

1. Atrophy of the entire half of the body.
2. Lowered temperature.
3. Small hand and foot on the same side.
4. Smaller lung excursions on the same side.
5. Difference in the carotid pulse.
6. Lowered intelligence.

*Diagnosis.* This is usually easy. Some describe a lateral flexion of the head following difficult labors, which clears up.

Rotary luxation must be differentiated; this can be done in the line of the spinous processes,—by mouth examination and from nervous symptoms.

Cervical Pott's disease; here the head is held to the side, but not turned to the opposite side; can be determined from the history and from palpation through the mouth.

Cervical rib may offer some difficulty.

Other forms of wry-neck are: bony; from eye defects; from defects in the ears, particularly suppurative; from enlarged lymph nodes; from goiter and other tumors; from skin affections; and, finally, the rheumatic.

*Treatment.* The older treatment was with apparatus, many kinds of which have been devised. All of these are inefficient. Lorenz has used forcible redressment by placing one hand on the head and the other on the well side of the neck, and making forcible manipulations. This is a dangerous procedure, and has caused several deaths, as well as tearing of the vessels and nerves. The operative treatment consists in either subcutaneous tenotomy or, better, an open operation, severing all the fibrous bands of the sterno-mastoid that keep the head in its abnormal position. Sometimes it is necessary to sever part of the trapezius and of the scalenus anticus, which is a rather difficult procedure. Occasionally the entire sterno-mastoid is removed, as recommended by Mikulicz. Occasionally the incision is made above to prevent the adherence of the muscles to the surrounding parts and the reproduction of the deformity. Various plastic operations on the muscles have been used, but these are not as good as simple division. Wullstein, instead of dividing the affected muscle, operates on the unaffected muscle by shortening it, hoping thus to overcome the deformity.

Following any operative procedure, the head should be held in plaster of Paris for two to four weeks, and then passive and active motion should be begun.

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## Editorials

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### INFANTILE PARALYSIS.

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IN all probability the present epidemic of infantile paralysis has run its course, and with the advent of cold weather the climax should be passed. But now is the time to plan what should be done in the future and to gather together the known results from this epidemic. We notice many meetings and papers being arranged, especially in New York City, entire programs being devoted to the discussion of infantile paralysis. Out of this mass of material and experience, during the coming winter we should be able gradually to systematize our knowledge and make plans for the next summer.

It seems to be the opinion of certain men closely connected with the New York epidemic that there will probably be a return of the present conditions next summer, and that the fight will have to be continued. At any rate, not only in New York, but in all other localities, especially in neighboring States, definite plans should be made in advance so that the best of the present knowledge can be used to advantage. There seems to be no doubt but that the general tendency is towards a definite increase of poliomyelitis, especially of the epidemic form, and this increase has assumed such proportions that not only has the medical profession been aroused, but also the state and national governments have been drawn upon.

The whole subject has become too large for the individual physician, and one man's knowledge is not sufficient to combat the present situation, especially since the known facts are constantly changing. Therefore we are calling attention to what is being done in the State of New York, and also to the plans as outlined from the Medical School of Harvard University.

On October 3, 1916, the Deputy State Commissioner of Health of the State of New York announced that a comprehensive plan for the after-care of all cases outside of New York City was being organized. Up to this date there were reported 3301 cases outside of the City of New York, with 589 deaths, so that there is a definite necessity and field for such work. The work has been placed under the supervision of Dr. Robert W. Lovett, Professor of Orthopedic Surgery at Harvard, with the assistance of Dr. Armitage Whitman of New York and Dr. John T.

Hodgen of Boston, who will give their whole time to this work. In a general way this is following the plan adopted in Vermont during the year 1914, which seemed to work out to advantage. New York City has already made definite plans for the after-care of its own cases. Evidently the whole problem is big enough so that definite plans are being made by the state and city officials.

The problem at present in New York has chiefly to do with the care of cases after the paralysis has taken place. In Boston the Harvard Medical School has appointed a commission consisting of the Professor of Orthopedics, Professor of Preventive Medicine, and Assistant Professor of Medicine, for the purpose of assisting in the early recognition, treatment and study of infantile paralysis. This commission has the unofficial approval of the State Board of Health, and is the first organized attempt to handle the problem in Massachusetts.

There is no question about the importance of being able to recognize the disease before the onset of paralysis, and probably the greatest hope in checking the damage lies in being able to make such a diagnosis. For this purpose the commission stands ready to send out a physician who is able to make a lumbar puncture at the request of any physician. As far as our present knowledge goes, the examination of the spinal fluid at the bedside, in relation to the polynuclear cell count, gives a fairly definite method of diagnosis before the paralysis appears. If a positive diagnosis can be made, then the use of serum obtained from patients who have had the disease seems to be of decided benefit at this stage.

From the work already done, and from results obtained in other places, this method of treatment seems to hold out the most hope in the treatment of early cases. Of course, work of this nature requires organized effort on a large scale, expert attention in the collection and preparation of serum, and its administration. If the usefulness of this or any other such method is proved, then it is certainly the duty of the proper authorities to undertake this work. It can never be done by individuals in the face of the present epidemic, and can be accomplished only by proper organization.

During the coming winter there will be accumulated the results which have been accomplished in this epidemic and we shall be in a better position to judge what steps should be taken. Besides the measures that will be necessary to take to stop the spread of the disease, that is, the question of quarantine, two features as to treatment stand out rather prominently: first, the early diagnosis and the possibilities of preventing paralysis; and second, the making of plans for the continued care of all cases that have been paralyzed. The assumption should be that the

coming summer will bring its cases, and it will be much safer to plan for it and know what to do before the season approaches. Whether or not we face another epidemic, the orthopedic care of the cases already paralyzed will require our careful attention, so that the best possible results may be obtained. This means educating the people and the physician as well, showing what can be done by detailed care.

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#### **PATHOLOGY OF TUBERCULOSIS OF BONES AND JOINTS.**

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It would seem as if the pathology of such a well-known subject as tuberculosis of bones and joints would be definitely established and that there would be no difference of opinion. But for certain reasons this whole question of pathology, what portion of the bone serves as a focus, whether the capsule of the joint is involved primarily or as an extension from a focus in the bone, is still in an uncertain state.

It was not so many years ago that any chronic, or even acute, bone lesion, was definitely called tuberculosis, and it is only recently that we have differentiated various conditions which might simulate the clinical course of tuberculosis. As an example, take the recent studies in the so-called Perthes' disease, which was formerly called tuberculosis. Our clinical data have not been thoroughly exact, and the more we can base our clinical judgment on a sound pathological basis, the greater advance we shall make in our knowledge of tuberculosis.

Pathologists make their studies of tuberculosis of bones and joints mostly from cases that present the end-results of a lesion and thus are not always in a position to settle the problem of a primary focus. A criticism of Nichols' extensive study—probably the most thorough that has been produced in late years—is that he was studying chiefly post-mortem or late operative results, as from amputations.

We need more extensive clinical studies, especially of those cases in the early stages of the disease, combining careful X-ray study, and especially the pathological material that may be derived from any operative interference. Also we need the results of experimental work, and would call attention to the paper of Allison and Fisher as a step in the right direction. Such work will probably be best accomplished when combined with accurate clinical study.

# Orthopedic Society Meetings

THE NEW YORK ACADEMY OF MEDICINE.

THURSDAY, OCT. 5, 1916.

"The Management of 'Pollomyelitis' with a View to Minimizing the Ultimate Disability," Robert W. Lovett, M.D., Professor of Orthopedic Surgery, Harvard Medical School. Discussion by Simon Flexner, M.D., Frederick Tilney, M.D., Charlton Wallace, M.D., G. R. Pisek, M.D., Foster Kennedy, M.D.

SECTION ON PEDIATRICS.

THURSDAY, OCT. 12, 1916.

"Lessons to the pediatricist from the recent epidemic of pollomyelitis."

Papers: "Epidemiology and public health problems," Claude H. Lavinder, M.D., U. S. Public Health Service.

"Review of the symptoms of onset collated from the cases at the Willard Parker Hospital," May G. Willson, M.D.

"Personal experience of the abortive and meningitic types," Leon Louria, M.D.

"The diagnosis from the point of view of the laboratory field worker," Josephine B. Neal, M.D.

"The treatment, prophylactic and curative," Herman Schwarz, M.D.

"The problem of the after-care," Donald Baxter, M.D.

SECTION ON ORTHOPEDIC SURGERY.

FRIDAY, OCT. 20, 1916.

Symposium on Pollomyelitis: a. "Treatment of the acute stage from a neuro-orthopedic standpoint," P. William Nathan, M.D., Israel Straus, M.D.

b. "Mechanical management of the convalescent period," Henry Ling Taylor, M.D.

c. "The value of massage and electricity," John J. McPhee, M.D.

d. "Prognosis," Reginald H. Sayre, M.D.

BOSTON ORTHOPEDIC CLUB.

MONDAY, OCT. 23, 1916.

"Remarks on Osteochondritis Desiccans and the Median Patella Incision," Dr. E. G. Brackett.

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## Book Review

*Muscle Training in the Treatment of Infantile Paralysis.* WILHELMINE G. WRIGHT, Boston Normal School of Gymnastics, 1905; Chirurg.-orthopaed. Klinik of Prof. Dr. A. Hoffa, Berlin, 1908; Assistant to Robert W. Lovett, M.D., Boston. Second Edition. Boston: Ernest Gregory. 1916.

In the after-care of infantile paralysis, after the acute symptoms have disappeared, much depends on the detailed plan that is made to help the muscles recover their strength. Muscle training should be done by a systematic method, and this book of thirty pages gives the exercises as used by the author in a clear and concise way. It should be of value to physicians and parents in the care of infantile paralysis.



# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, etc.
- X. War Surgery.

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## I. TUBERCULOSIS OF BONES, JOINTS AND TENDONS.

POTT'S DISEASE IN ADULTS: REPORT OF 61 CASES. T. M. Foley. *Washington Medical Annals*, September, 1916.

The author concludes from studies of adult Pott's disease that the diagnosis is more difficult than in children, that pulmonary condition is no detriment to recovery; paraplegia appeared in one-half the cases, including all the dorsal ones. Abscess appeared in all the lumbar cases. Disease originating in adult life is not considered malignant.—*Curtis Lee Hall, Washington, D. C.*

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## II. PARALYTIC DISEASES AND THEIR DEFORMITIES; NERVE LESIONS WITH ARTHROPATHIES.

A NOTE ON THE SERUM TREATMENT OF POLIOMYELITIS. Simon Flexner. *Jour. Amer. Med. Assn.*, Aug. 19, 1916.

It has been demonstrated by Flexner and Lewis that monkeys which had recovered from an attack of poliomyelitis induced experimentally were not subject to successful reinoculation with the virus of the disease. It was also discovered that the blood of human beings who had recovered from poliomyelitis contained certain immunity substances which possessed the power of neutralizing the virus of poliomyelitis when the serum and virus were brought together in the test tube.

The therapeutic value of the immune serums was demonstrated experimentally by injecting monkeys with the virus and following this by injection of the serum. It proved of marked benefit in practically all cases. Injections of the immune serums should be made into the subdural space.

The serum therapy in man has been tried out, and reports from a small number of cases seem to indicate that it is of value. The immune substances apparently remain in the blood for many years after recovery from an attack of poliomyelitis.—*F. G. Hodgson, Atlanta.*

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LABORATORY AIDS IN THE DIAGNOSIS OF POLIOMYELITIS. Josephine B. Neal. *New York Medical Journal*, July 22, 1916.

The writer gives a short résumé of some of the useful methods as aids in the diagnosis of poliomyelitis. Some of the sporadic cases, as well as the epidemic cases, are typical, and it is, therefore, essential to be able as far as

possible to determine the type of disease. Washings from the respiratory tract of poliomyelitic cases have been inoculated into monkeys and the disease reproduced, and sections of the brain have shown globoid bodies described by Flexner and Noguchi.

The neutralization test of serum of a suspected case in stage of recovery is mixed with a known fatal dose of an active virus. They are incubated and later injected intracerebrally into the monkeys. Failure of the development of the disease shows that the virus has been neutralized. This does not furnish conclusive evidence of poliomyelitis, since serums from those known to have been free from the recent attack of the disease have sometimes neutralized the virus. Blood sometimes shows varying increase in leucocytes and polymorphonucleosis. This is, however, characteristic of other diseases. The most reliable method is examination of spinal fluid.

The first 24-48 hours after its onset, poliomyelitis must be differentiated from early epidemic meningitis and a meningism of other infections. In the early stage of poliomyelitis spinal fluid is clear, as a rule, with generally good fibrin web formation. Slight increase of albumin and globulin and cellular elements. Reduction of Fehling's is prompt. Polymorphonucleosis may reach ninety per cent., usually about sixty. Frequently large mononuclear cells appear; may be characteristic of poliomyelitis. Two rare fluids sometimes occur when hemorrhage is unusually extensive; one with red fluid cells evenly diffused through the fluid. When collected in successive tubes, the specimens are all homogeneous. This differentiates it from bloody fluids obtained by the accidental puncture of vessels. The second, or so-called syndrome of Froin, is yellow in color and coagulates spontaneously.

A week more is necessary after the onset to differentiate poliomyelitis from tuberculous meningitis. The spinal fluid in both cases shows an increase in albumin and globulin. Usually in poliomyelitis this increase is not as great as in tuberculosis. Reduction of Fehling's is usually better. Cellular elements less in poliomyelitis. Mononucleosis in both conditions. In acute tuberculosis there is often a polymorphonucleosis. Increase of albumin and globulin and weak Fehling's may not show poliomyelitis.

Summary: The spinal fluid is increased with increasing albumin and globulin, good reduction of Fehling's, varying cellular increase, mostly mononuclear, cloudy fluid, must be differentiated from purulent meningitis.—*William Jackson Merrill, Philadelphia.*

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THE DIAGNOSIS AND TREATMENT OF ACUTE ANTERIOR POLIOMYELITIS IN THE PRE-PARALYTIC AND POSTPARALYTIC STAGES. M. N. Neustaedter. *New York Medical Journal*, July 22, 1916.

The points taken up in this article are too numerous to be clearly shown in a brief abstract. The etiology is discussed, the assertion is made that the mode of infection is fairly well established. Infections are propagated by the circulatory or lymphatic system. There is no evidence that the circulatory system is the primary route of the virus; evidence in favor of the lymphatic system seems to be conclusive. Mode of infection may be through direct contact with persons, living animal or dead objects. House pets, toys, books, linen, dirt, dust, etc., should be suspected. Period of incubation two to thirty-three days. The writer has record of incubation of one day. As to age, statistics vary. It shows predilection to individuals in early life. It undoubtedly is highly contagious and infectious, yet one member of a family may have the disease in the same house under same conditions, and the rest not.

Poliomyelitis is a pathological entity, not a clinical one. It does not affect

the anterior horns exclusively, but the entire cerebrospinal axis. In the prodromal stage there is hyperemia of the cord and meninges, congestion of all of the vessels associated with these structures. There is also associated edema. The cell count is usually high, globulin increased, Fehling's reaction intense. Histologically, there is a perivascular and interstitial infiltration of round mononuclear, polymorphonuclear, plasma and endothelial cells. As the case goes to a subacute or chronic stage, the perivascular exudate forms a sheath surrounding the vessels pressing on the lumen and reduces or eliminates nutrition.

The question of immunity is taken up and elucidated by laboratory and clinical data. Our hindrance in treatment of this disease is the difficulty of early diagnosis. Fever is the first sign, sometimes vomiting and diarrhea, always naso-pharyngeal symptoms. Frequent attacks of sneezing, with copious nasal discharge. Nasal mucous membrane edemic, glistening and anemic, with a serous, frothy transudate. This condition persists for a few weeks after the paralysis has set in, the mucosa becomes anemic and atrophic. The author lays stress upon this sign. Headache and pain are usually present.

Synopsis of symptoms: Sudden onset with fever, headache, drowsiness, often twitchings or convulsions, pain in extremities, gastro-intestinal disturbances, nose and throat symptoms and the cytological findings in the cerebrospinal fluid.

Prophylactic measures for the sake of the family and public are essential. Cleanliness of the person and surroundings essential. During febrile stage, complete mental and physical rest. When the acute stage is past certain active treatment must be instituted. Usual guide as to beginning of treatment is subsidence of pain, not earlier. Warm baths during the afebrile stage, and two weeks after pain is gone begin massage, passive motion, galvanism. Active exercise of the muscles with small infants can be obtained by placing child in bath to play with floating toys, encouraging child to handle objects with the affected limb. Children old enough can be persuaded to counteract antagonistic passive movements by the masseur. Treatment should be kept up indefinitely, for frequently function returns after several years.—*William Jackson Merrill, Philadelphia.*

**SPECIFIC TREATMENT OF INFANTILE PARALYSIS.** Abraham Sophian. *Jour. Amer. Med. Assn.*, Aug. 5, 1916.

Sophian is a member of the committee in charge of the treatment of these cases in the acute stages. He has had an unusual opportunity to study this disease in the recent New York epidemic. He shows that there is a close analogy between infantile paralysis and epidemic meningitis. The symptoms in both conditions may be grouped into those caused by: (1) hydrocephalus, (2) the inflammatory reaction in the meninges and nerve substance; and (3) paralysis. The treatment should also be conducted along similar lines: (1) relief of hydrocephalus by aspiration of spinal fluid; (2) intraspinal injection of serum, normal human, normal horse or convalescent; (3) control of special symptoms, as respiration paralysis; (4) symptomatic general treatment; and (5) orthopedic treatment.

Some interesting cases are reported giving the result of various forms of treatment. It is to be regretted that the series is not larger, and to be hoped that later a more extensive series will be reported.

This article shows very conclusively that the generally accepted idea that nothing can be done in the acute stages is entirely erroneous. Much can be done, and should be done, to obtain the best results for these very unfortunate cases.—*F. G. Hodgson, Atlanta.*

OBSTETRICAL OR BIRTH PALSY. T. Turner Thomas. *The Amer. Jour. of Obstetrics and Diseases of Women and Children*, April, 1916.

Duchenne-Erb palsy implies: first, an injury to the shoulder region; second, occurrence at birth; and, third, the lesion is at the junction of the fifth and sixth cervical roots of the brachial plexus. The type of paralysis commonly present at birth is very frequent in adults, although in them it is usually much less severe. In these cases we have a varying grade of palsy of the upper extremity associated with a severe traumatic condition in the region of the shoulder joint.

The best evidence that most birth palsies of the upper extremity are due to the impaired shoulder joint is to be found in the improvement in the power and usefulness of the whole limb from improvement of the function of the shoulder joint. Treatment based upon the theory of an injury of the brachial plexus has given very indifferent results.

The author's treatment in these cases is based upon a very simple principle, i.e., to restore as nearly as possible the normal function of the shoulder joint. If there is no displacement in the shoulder joint a perfect recovery will be obtained from exercises alone. A case of birth palsy with the typical internal rotation of the limb and the characteristic limitation of abduction and external rotation, as old as two or three years, will show on examination a posterior subluxation of the shoulder joint. The head of the humerus normally projects in front of the anterior margin of the acromion, and below the posterior margin of the acromion there is a depression. This relationship is reversed in a posterior subluxation. The evidence of a traumatic origin at birth is the bending downward and forward of the anterior portion of the acromion, which is always present, and which could not be explained by an injury of the brachial plexus.

In infants it may be necessary to etherize the patient in order to make the diagnosis and restore the humerus to its normal position, and it may be held there for six weeks by a light cast with the arm in abduction and external rotation.

In old dislocations reduction is difficult and often impossible. Complete reduction is practically always impossible without operation, because otherwise the bent portion of the acromion remains an inseparable obstruction. Vigorous and prolonged exercises afterward are indicated to improve the motion of the joint. To improve external rotation and abduction is the important feature.

The author's operation: A semilunar incision along the margins of the acromion, the deltoid divided and the upper end of the humerus freely exposed, the obstructing portion of the acromion removed. This is cartilaginous and can be cut with a knife. The head of the humerus is then pressed forward into its normal position. Division of the subscapularis insertion will usually be necessary. The external rotator tendons may be divided at their insertion into the greater tuberosity, and the cut ends sutured well forward on this tuberosity with the arm in abduction and full external rotation. The long tendon of the biceps must not be injured. The position of the arm is maintained while the deltoid is reunited, and the arm is fixed in this position for six weeks by a plaster cast.

The immediate improvement in abduction and external rotation from operation is striking and a marked improvement in the power of the limb is soon apparent.

Eleven case reports follow.—Walter G. Elmer, Philadelphia.

## III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

BONE AND JOINT DISEASE IN RELATION TO TYPHOID FEVER. John B. Murphy. *Surgery, Gynecology and Obstetrics*, August, 1916, p. 119.

Murphy begins his paper with statistical comparisons as to age and sex incidence of typhoid fever, age and sex incidence of post-typhoid bone lesions, the location of bone lesions, nature of bone lesions, and the time of onset after the initial disease.

Under Pathological Anatomy of Typhoid Osteitis, he says that "the bone lesions are located in the *diaphysis of the long bones*." "The subperiosteal medullary layer being most frequently involved, next the intracanalicular and the central medulla, the infarcts with the bacilli being lodged in the smaller vessels, of which the periosteal is the smallest."

The chief symptoms of typhoid osteitis are pain at the site of the lesion, swelling, and as a rule, absence of fever. The blood shows leucopenia.

Next the X-ray findings are described. It would seem that the X-ray findings as shown would not be conclusive in differentiating from a so-called burned out osteomyelitis, or even bone syphilis, since the appearances as described are much the same.

He also says, "A search for the bacilli in the feces is only positive in sixty per cent. of the cases."

A description of the technique for finding and growing the bacillus is given.

He further says that "No definite relationship has been established between the finding of the bacillus in the feces and the secondary manifestations in the bones and joints."

Under treatment, opening, trephining, scraping, draining, disinfecting and washing out the cavity with five per cent. phenol, then with 1:1000 solution of hypochlorite of calcium, and immediate closing of the wound to avoid mixed infection is advised.

Typhoid spine is considered separately from the long-bone infections. The local and general symptoms, neurological and visceral symptoms, are described at some length, also the X-ray findings. The differential diagnosis is but briefly considered. The treatment is considered at length. Under prophylaxis, Murphy says, "rest in a rigid bed or cot, and the horizontal position insisted upon." After the pain disappears autogenous vaccines if possible to obtain them.

When spinal symptoms are made manifest he recommends "a leather jacket, which is far better than a brace and more comfortable than plaster." Some of the readers will not be in entire accord with this statement. Nothing is said about the method of treating patients who have neurological conditions, which are described under symptoms.

Murphy says that spontaneous dislocation of the hip is more frequent after typhoid than any other disease except tuberculosis. Under treatment of this condition the importance of prevention is emphasized. "Extension by weight and pulley to overcome faulty position. Aspiration to prevent luxation if fluid can be made out." If luxation has occurred, aspiration is recommended, and the injection of one per cent. each of formalin, creosote and guaiacol in 100% glycerine.

"The early luxated hip should be reduced by bloodless method of Lorenz and held in Lorenz position as soon as convalescence is well established." Nothing is said about reduction of early cases by means of traction, or after-treatment.

Next is considered experimental infection of joints, with allusions to the work of several men. This section of the article is too lengthy to permit of abstraction.

In the treatment of arthritic form, rest of joint is recommended, good position, aspiration, injection and lavage. No drainage. Auto-sensitized vaccines if the patient is convalescent. Advises against immobilizing the knee and hip in plaster as it favors ankylosis. Early opening of joints is advocated if they become involved by direct infection.

The article ends with reports of cases.—*Frank R. Ober, Boston.*

**CONGENITAL AND BONE SYPHILIS.** Abner Post. *Journal of Cutaneous Diseases*, August, 1916.

A short, interesting and entertaining paper dealing with "certain features in the study of congenital syphilis."

The writer has noted so often the occurrence of symmetrical synovitis of the knee joints as a result of hereditary syphilis, that he considers it worthy of mention as a symptom which ought to be looked for. Synovitis of other joints, also symmetrical, occurs less frequently. Synovitis of both knees has occurred so frequently in connection with interstitial keratitis and Hutchinsonian teeth that such a triad seems of equal, if not greater, value than the famous triad of Hutchinson,—interstitial keratitis, deafness and notched incisors.—*Arthur J. Davidson, Philadelphia.*

#### IV. METABOLIC DISTURBANCES CAUSING BONE AND JOINT DISEASE.

**LOCALIZED OSTEOSPONDYLITIS.** Willis C. Campbell. *Jour. Amer. Med. Assn.*, Aug. 19, 1916.

Campbell reports four cases which he says are analogous to monarticular osteoarthritis as it is found in the hip. There is a lippling or outgrowth of bone from one or more vertebrae near the intervertebral disc. This may cause local or referred pains, the latter being sometimes mistaken for abdominal conditions. The etiology is probably the same as in monarticular osteoarthritis. Diagnosis is made by the roentgenogram. He presents some interesting diagrammatic drawings.—*F. G. Hodgson, Atlanta.*

**A STUDY OF THE CALCIUM AND MAGNESIUM METABOLISM IN A CASE OF CHRONIC GOUT.** Jacob Rosenbloom. *Amer. Jour. of the Med. Sciences*, August, 1916.

The results obtained in a study of the calcium and magnesium metabolism in a case of chronic gout of about fifteen years' standing, showed that in the given case the calcium and magnesium metabolism were normal in character.—*Arthur J. Davidson, Philadelphia.*

#### VIII. TRAUMATIC LESIONS, FRACTURES AND DISLOCATIONS.

**CASE OF FRACTURE OF THE ACETABULUM.** Daniel L. Borden. *Washington Medical Annals*, May, 1916.

Borden reports a case of fracture of the acetabulum. Direct violence drove head of femur through acetabulum.

Symptoms: Bruise over acetabulum, thigh semiflexed, adducted and shortened about one and one-half inches, absence of great trochanter. Thigh could be further flexed and adducted, but only slightly abducted. X-ray showed head of femur forced through acetabulum. Reduction on fluoroscopic table: Pelvis was fixed laterally and downward traction applied until head was in proper position. Reduction maintained by outward and downward traction

for forty-five days. Passive motion begun on sixth day and continued until patient was up and around.

Within seventy days was able to walk without assistance. Practically no shortening and has very slight limp.—*William Jackson Merrill, Philadelphia.*

#### IMMOBILIZATION IN THE TREATMENT OF INJURIES TO THE FINGERS AND TOES.

J. W. Handy. *The Tennessee State Med. Assn. Jour.*, July, 1916, p. 132.

Handy presents a very useful article concerning the treatment of injuries of the fingers and toes. Some of the points taken up are as follows: Time should be considered, especially with wage earners, so that the restoration of function shall be accomplished in the shortest possible time. Often these injuries are considered trivial, receive improper care, and serious conditions result through infection and bad apposition of the parts. Dirty water and dressings are often used, which are a great menace to recovery. First-aid packets should always be available. Benzine and alcohol and weak solutions of iodine should be used freely.

The author makes reference to the necessity for the surgeon's using gloved hands in removing tissues which are likely to slough and says that the treatment should be conducted under aseptic conditions. Free drainage is best when indicated.

The points to be borne in mind during treatment are: 1. Injuries look worse and more extensive than they really are. 2. Ability to repair is comparatively easier than other parts. 3. Sutures should be placed with little tension. 4. Drainage where the laceration is comparatively extensive. 5. Successful amputation can be done without going far above the damaged parts. 6. Complete immobilization often prevents extensive infection. 7. Immunizing antitetanic serum 15 cc. often benefits. Immobilization means fixation of the hand or foot and all of the muscles controlling these parts.

In his summary the author emphasizes: first, control of hemorrhage; second, cleansing of wound with benzine, alcohol and iodine; third, removal of all tissues that are likely to slough; fourth, coaptation of surface and proper tension of sutures; fifth, drainage when indicated; and sixth, antiseptic dressing and immobilization.—*William Jackson Merrill, Philadelphia.*

#### SEPARATION OF LOWER FEMORAL EPIPHYSIS. W. Russell MacAusland. *Surgery, Gynecology and Obstetrics*, August, 1916, p. 147.

In this article Dr. MacAusland reports two cases of his own and briefly reports thirty-six cases of other men. In the introduction the author states that the fracture is rare, and is usually due to direct violence, the deformity being a backward displacement of the epiphysis into the popliteal space. Injuries to nerves and vessels are likely to occur from closed reduction and complete reduction is improbable by this method. Irregular epiphyseal growth is likely to occur and hemorrhage into the knee joint with stiffness is a frequent result.

Open reduction is advised. A tourniquet is applied to prevent hemorrhage into the joint. A lateral incision is made and carried down to the seat of fracture by blunt dissection. The lower fragment is pried into place and the irregular surfaces accurately apposed. Plaster is applied, and at the end of a week bivalved and slight motion begun, leaving the posterior shell under the leg. In ten days the plaster is removed.

The author's own case reports follow and also a concise tabulated report of thirty-six cases with notes referring to these and the names of the authors.—*Frank R. Ober, Boston.*

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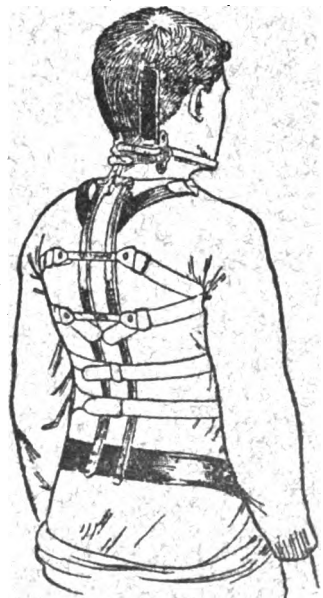
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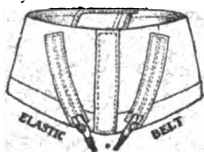
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## THE CONSERVATIVE TREATMENT OF CONGENITAL CLUB-FOOT.\*

BY EBEN W. FISKE, A.M., M.D., PITTSBURGH,

Orthopedic Surgeon to the Western Pennsylvania Hospital, Pittsburgh, Pa.

IN the orthopedic treatment of deformity both restoration of form and restoration of function are necessary for a perfect result. In no congenital malformation are these elements of treatment more important than in talipes equino varus, wherein the reshaping of the foot to the normal and the reestablishment of its natural action are of equal desirability. It is, then, obviously essential that the mechanical correction of the deformity should in no way prejudice the return of active function, but rather that each step be taken with the definite object of restoring the usefulness as well as the cosmetics of the foot.

That the selection of the early, or re-formative, treatment is of extreme importance in obtaining a satisfactory end-result—which implies proper acquirement of function—has been demonstrated to the writer by the results of a considerable number of cases treated by different methods. In these findings,<sup>1</sup> there was shown a striking difference between the results of those cases which had received operative or other treatment of sufficient trauma to require anesthesia, and those in which treatment had been confined to the non-operative or manipulative method. The comparisons were made on the same basis, with cases in every way comparable at the inception of treatment, and gave the following proportion of satisfactory end-results, viz: 55% in the operated group, as against 95% in the non-operated—a difference of 40%.

Without quoting at length from this previous report,<sup>1</sup> the following from its summary covers in brief the writer's explanation of the above figures: "... The deformity being shared by all the structures of the foot, that treatment only which is not localized in its application (as is the operative) is productive of uniformly satisfactory results. The destruction of any tissues prevents the restoration of natural shape,

\* From the Orthopedic Department of the Massachusetts General Hospital, Boston.

strength, and balance of the foot, and is prejudicial to the return of normal function. The non-operative treatment of club-foot avoids these errors, and takes advantage of plasticity and growth. . . " and, it may be further emphasized, by its preservation of all the finer structures favors in every way restoration of the natural action of the whole foot, and of its intrinsic muscles and articulations.

The dangers of traumatism in the correction of deformity—contraction from scar tissue, impairment of muscle power, balance, and co-ordination by tenotomy, delay in growth and development following destruction of vessels and nerves, shortening and rigidity from bone operations—have been sufficiently obvious to warrant strict avoidance wherever good results could be obtained without their incurrence. It is partly for this reason, but more because of ease in application and the assurance of good results, that non-traumatic methods have been conceded to be indicated for the soft elastic club-foot of the infant. In older and more rigid cases, however, cutting and forcible manipulation or wrenching under anesthesia have been deemed necessary for satisfactory reshaping, regardless of their effect upon future function.

At the conclusion of the article quoted above,<sup>1</sup> the following statement was made: "It is the writer's belief that this [non-traumatic] treatment can be almost equally well adapted to older, more rigid feet, and to relapsing cases. During all of childhood the bones are plastic, much advantage may be taken of growth, and walking may be made an active force for correction. . . With the promise of a better ultimate result from non-interference with the anatomic structures and physiologic equilibrium of the foot, it would seem justifiable to give it a fair trial." At that time, opportunity had not been sufficient for fully testing this assertion, but it has since been the author's privilege to apply the non-operative treatment to several older cases with rigid non-correctible club-feet, and to ten children with relapsed post-operative feet. The results of these cases seem to have justified the theory in a practical manner, especially the relapsed feet, in which, because so much already has been done of a traumatic nature, with resultant scar tissue contraction, muscular atrophy and impaired nutrition, it is fair to consider that the difficulty of correction is often greater than in entirely untreated cases of the same age. It is for this reason that the writer has felt justified in reporting these cases in support of the principle of strict non-traumatism.

The characteristic deformity of the post-operative, relapsed club-foot, with the forefoot adducted and inverted, the fifth metatarsal base and cuboid low, prominent and often calloused, and the os calcis inverted

and frequently elevated, is all too well known. Neither the equinus nor the varus may be marked, but the resistance of the foot to correction is out of all proportion to the deformity. This, of course, constitutes the chief difficulty in treatment, for once the flexibility of the foot is restored, even partially, the correction of the deformity becomes relatively simple. But can further operation increase this flexibility, except by further weakening an already weak and helpless member, or can intrinsic action be restored by cutting or tearing useful tissues? It seems to the writer that the indication now is to preserve and foster all the structures which have not already been hopelessly damaged, by constructive rather than destructive measures. With the absolute avoidance of trauma, the foot should be given a chance to *grow* straight, accompanied by the gradual and increasing exercise of all its parts. This is the essence of the conservative treatment, the term "conservative" being used in its fullest sense.

For the attainment of perfect results by this method there are three quite obvious requisites. The first is constant personal management of the case. Thorough knowledge of the condition of the foot and the forces applied are necessary at all stages, and forbid divided or uninterested care. Second, and even more essential, is a strict adherence to the principles of non-traumatism at all stages, regardless of any apparent indication for more drastic interference. If we are correct in assuming that damage to any structure tends to impair its future usefulness, then the application of this theory must be carried out in every detail. At no time during manipulation or fixation must undue force be applied, the definite production of pain (there being no anesthetic) offering for this quite a reliable guide.

The third factor, and by far the most important, is a careful and thorough technic. The measures available for conservative treatment are not new—manipulation to the point of tolerance, plaster redressment or other mechanical fixation, corrective weight bearing, massage and exercises. It is the proper and conscientious use of these methods that permits of the moulding and strengthening of the whole foot, and simultaneously enables the application of stress on particular structures as indicated. Advantage must be taken of all favorable factors present in the foot, with special reliance upon growth and the stimulation of such muscular forces as will favor over-correction as the reshaping proceeds; for the aim of the treatment is not only to give a foot in which the form has been completely restored, but to furnish the power to actively, as well as passively, overcorrect, with the originally overstretched muscles and ligaments fully as short and strong as

their opponents. No result can be considered satisfactory until this has been accomplished.

For each of the three steps in the treatment of relapsed club-foot,—correction, overcorrection and retention,—somewhat different measures are necessary. The first, correction of the foot to the straight position, is, of course, the most difficult, as in this stage the rigidity of the foot must be overcome, and the reshaping of bones and articular facets, as well as the stretching of tight ligaments and firm scar tissue, must be accomplished. The earliest measures are, therefore, directed toward the production of flexibility, as this must accompany or precede any change in shape, and for this, together with the first steps in the reduction of the deformity, the so-called walking plaster has been found efficient. This plaster exerts a constant force for correction, not only by holding the foot in the best position obtainable, but also by furnishing means whereby the body weight may act as a constant limbering as well as a correcting force.

The application of the walking plaster is as follows: The leg, toes to knee, is painted with Heusner's glue,<sup>2</sup> over which stockinette is stretched and accurately smoothed and fitted, the folds at the front of the ankle being cut out with scissors. Under the prominence on the outer border of the foot—usually the cuboid—a round or oval felt pad is laid, sufficiently thick to exert distinct pressure at this point. (Fig. 1, a.) Over the foot is now applied a plaster-of-Paris boot, flattened over the metatarsal heads, and moulded laterally at the heel. It extends from the tips of the toes to the malleoli, being cut away beneath the external malleolus and in front of the ankle, so that in forced correction there will be no impingement of its edge against the skin. At the same time a legging of plaster is applied from the tibial tuberosity to about an inch above the top of the boot. When these have hardened actual control of the foot as a whole is greater than it was when manipulated by hand, and by forcing the boot into an abducted and everted position, often more correction of the foot can be obtained than was anticipated. With the foot so held, and the legging strongly rotated inward on the leg, the two plasters are now joined by a third, so establishing the maximum corrected position, abduction being preserved by the adherence of the plaster, through the stockinette and glue, to the skin. (Fig. 1, b.) When possible, tension is made at the same time on the tendo Achillis, and the foot approximated to the dorsiflexed position. Beneath the sole of the boot an outside wedge of plaster is now laid, similar to an outside lift on a shoe, which furnishes a level surface for walking and helps to maintain the eversion of the foot. (Fig. 1, c.) By making this

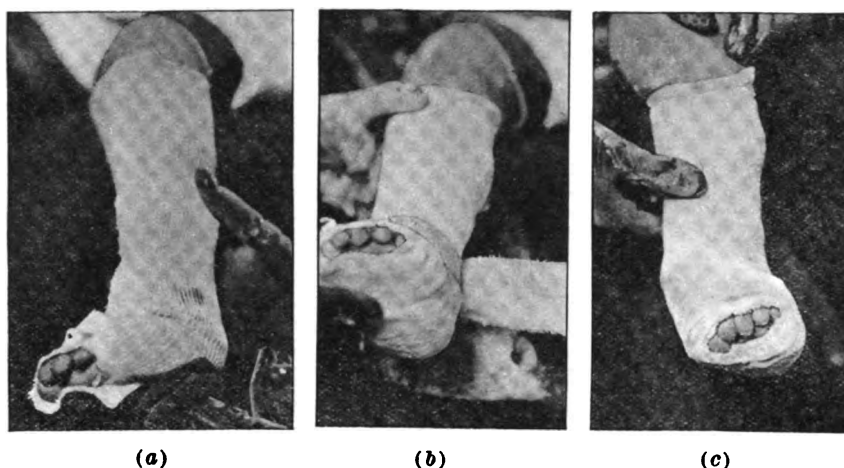


FIG. 1. WALKING PLASTER.

- (a) Stockinette glued to leg. Pad placed under cuboid.
- (b) Plaster boot and legging have been applied and are ready to be joined by a third plaster while the foot is held in corrected position.
- (c) Finished. Note the outside lift of plaster and the position of the foot in eversion and abduction.

wedge a little thicker at a point corresponding to the position of the pad, an active force for correction should be produced upon the posterior part of the foot, as at every step the support of the body is transmitted from the floor up through plaster and pad onto the resistant cuboid and anterior end of the os calcis. As a result not only does this most difficult portion of the foot tend to become everted and restored to its normal level, but the continual pounding has initiated or increased the flexibility of the whole foot. This type of plaster is, therefore, the best means of inaugurating treatment, as well as furnishing the foundation upon which the conservative method of correction of the more rigid cases is laid.

When a certain amount of flexibility and fair correction have been established, and fixation must be employed in which more force for over-correction of the whole foot is possible, a plaster similar in principle to that described by Ehrenfried<sup>3</sup> may be used to advantage. In this, as in the walking plaster, stockinette and glue are used instead of sheet wadding, so avoiding the clumsiness and dangers of the latter, as well as affording means for more accurate application of mechanical forces through a close-fitting plaster. The stockinette in this plaster runs from

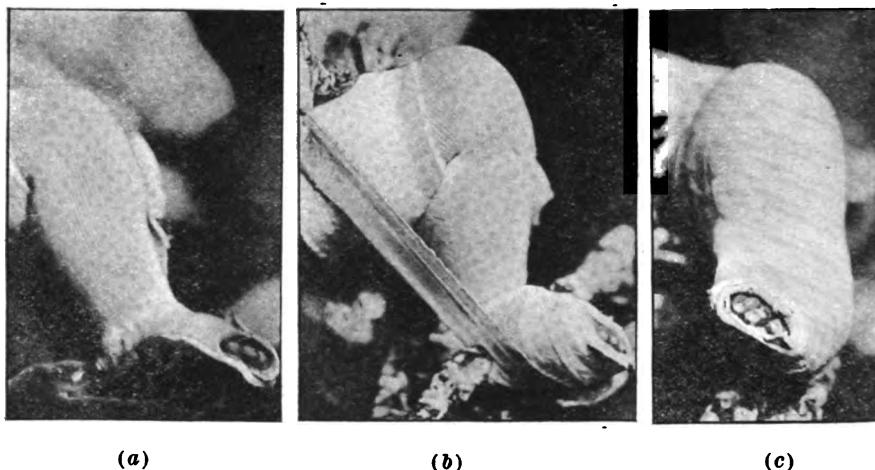


FIG. 2. OVERCORRECTING PLASTER.

(a) Stockinette glued to leg and thigh. Foot and thigh protected by felt.

(b) Plaster thigh cuff and boot applied. Third plaster around boot and up leg, ready to pass over thigh, creating forcible eversion and dorsiflexion of the foot.

(c) Finished. Note eversion, abduction, and dorsiflexion of the foot.

toes to groin, with the knee flexed, the thigh and sole being protected by felt. (Fig. 2, a.) The plaster thigh cuff and boot are then applied, the latter well moulded and including the heel, but cut well down in front of the ankle to prevent impingement. When these have hardened, the third plaster is carried twice around the boot just behind its center (opposite the cuboid), passing medially over the foot and toward the outer edge beneath, thence up the outside of the leg over the thigh cuff (the knee being flexed) and back under the foot again. (Fig. 2, b.) This is repeated once or twice, exerting all reasonable force to evert and dorsiflex, and the plaster is then finished in. (Fig. 2, c.) The abduction element is obtained by holding the foot in this position just before the plaster sets. In the more stubborn feet this overcorrecting plaster can be alternated with the walking type to furnish added flexibility to the foot and to prevent stiffness from prolonged flexion of the knee. By these methods, marked overcorrection may be obtained, with the inverted heel and low cuboid taking a normal position if all stress has been put on the posterior foot, the anterior in these cases following the posterior, while the reverse seldom occurs.

Overcorrection having been obtained, the problem of maintaining this position until the structures have become so adapted to their new relations and duties that relapse is impossible, naturally constitutes as



FIG. 3.

Retention walking brace. Inside upright, outside lift on shoe, T-strap at ankle.

important an element in the treatment as either of the preceding. Not only can all advantages of the previous steps be either permanently secured or wholly lost at this stage, but also it is here that most may be done toward promoting proper function. As the retentive brace must hold the foot in as much overcorrection as is feasible, and also permit of normal exercise and motion in this position, the brace with an inside upright attached to an ordinary well-fitting shoe for its foundation has been found the most efficient. (Fig. 3.) The laced upper holds the foot better than straps, the heavy and inefficient sole plate of the old type varus brace is eliminated, and an outside lift on the sole of the shoe maintains eversion, which is further aided by a T-strap passing from the outside of the shoe around the ankle to the upright, which is swung away opposite the malleoli for this purpose. A stop-catch joint at the ankle gives motion and prevents toe drop, while a lateral twisting of the



joint so that its plane of action points forward and inward, favors abduction in walking. Apparatus to wear at night is essential in maintaining a constantly overcorrected position, and for this a simple brace with sole plate, straps and inside upright without a joint, or a well-moulded night plaster, is sufficient.

As the aim of the conservative treatment is to restore function as well as form, at no stage must this object be neglected. Advantage should be taken of every change of plaster to manipulate the foot into the best position obtainable, to massage it thoroughly, and to direct the patient in an active attempt to correct or overcorrect the deformity. While these attempts may not find expression in motion during the early stages, they undoubtedly do stimulate the nerve-muscle mechanism, and make for earlier resumption of normal use. The factor of corrective weight-bearing is employed in both the walking plaster and brace, in each case favoring the proper function to follow. With the omission of the plasters, massage and muscle training can be begun in a systematic manner, so that this part of the treatment forms an important detail of the retentive stage. Although massage of the whole atrophied leg is indicated at least twice a day, special attention should be given to those muscles overstretched and weakened by the deformity. These may also be given active exercises, at first with passive aid coincident with the child's voluntary impulse, followed by more powerful efforts against resistance. While these results depend to some extent on the zeal and intelligence of the parents, considerable confidence may be felt in a return of these muscles to normal, and even supernormal, strength under favorable conditions.

Before leaving the subject of technic, mention may be made of the "talipedometer," as termed by the writer, which has proven of the greatest assistance in this work. (Fig. 4.) It is designed to record in degrees the angles of deformity in the three planes of motion of the foot, on three protractors. Zero in each protractor has been made relatively near the position of a normal foot, held straight, from which all degrees toward deformity (equino-varus) are termed minus, and toward overcorrection (calcaneo-valgus) plus. The instrument being placed on the leg and foot in the manner indicated in the photograph, three readings are taken at each visit of the patient in the same order—vertical (+ flexion, — extension), horizontal (+ abduction, — adduction), and rotation (+ eversion, — inversion)—and so placed on the record. Successive readings then show the gain or loss in the three elements of the deformity following each treatment, this not only giving a fairly accurate record of the general progress of the foot, but also calling attention

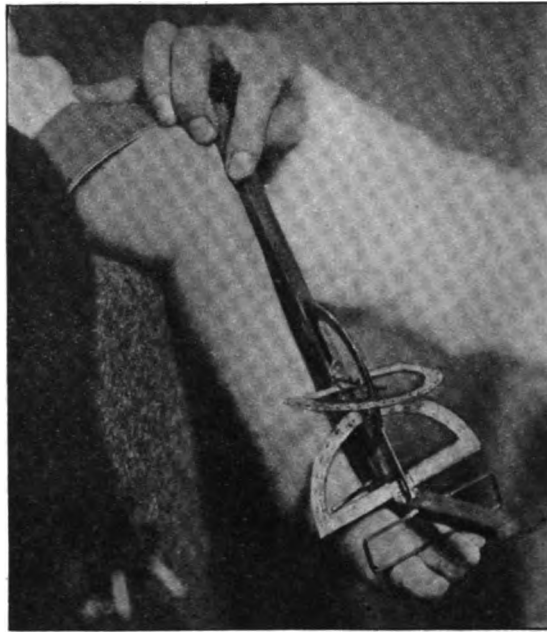


FIG. 4. THE TALIPEDOMETER.

The foot and leg bars are joined by a universal joint which is placed at the fold of the ankle, while guides hold the bars in definite relation to the foot and leg. The amount of deformity in the three planes is then shown by indicators on the three protractors.

to any one of the elements which is not keeping pace with the others.

It is interesting to note through the medium of the talipedometer the results with each of the treatments outlined above. With the over-correcting plaster, the average change with each visit was  $+11^{\circ}$  (dorsiflexion),  $+5.6^{\circ}$  (abduction),  $+8.7^{\circ}$  (eversion), this being the greatest gain by any method, as might be expected when it is remembered that this plaster is used with the foot flexible and in favorable position for rapid gain. With the walking plaster, the average change is  $-2^{\circ}$ ,  $+1^{\circ}$ ,  $+5.5^{\circ}$ , indicating that it does not help in dorsiflexion, only a little in abduction, but definitely creates eversion, the stubborn element for which it is designed. Simple retention of the overcorrected foot, with braces only, gives an average of  $-3^{\circ}$ ,  $-4^{\circ}$ ,  $-5^{\circ}$ , a loss in all planes, which might be anticipated as the foot is in the extreme overcorrected position when the brace is applied. With retention, plus massage, manipulation and exercises, however, there is an average gain of  $+5^{\circ}$ ,  $+11^{\circ}$ ,  $+2^{\circ}$ , which implies the establishment of active overcorrection over the passive



(a)



(b)

FIG. 5.

**CASE 1.** Relapsing post-operative club-foot, rigid and not correctible.

(a) Taken May 6, 1915, after one plaster.

(b) Photograph taken July, 1916, one year after treatment, showing the restoration to perfect form and function, the foot being held in active overcorrection.

overcorrection afforded by apparatus. The fact that this gain is greatest in abduction, the element most difficult to maintain, is significant of the benefit of this part of the treatment. The total gain, as shown by early and late readings, is given in each of the following cases.

**CASE 1.** F. C., 188427, male, age three years six months.

*Past History.* Left foot: at age of four months multiple tenotomies, repeated at one year with pegging of epiphyses for delayed development. Plaster and brace.

April 13, 1915. Left foot held adducted, os calcis inverted, cuboid low, not correctible by force. Photograph (Fig. 5, a) and measurement taken two weeks later, after one plaster. —30°, —25°, —20°.

July 13, 1915. Has had one walking and three overcorrecting plasters. Foot held in overcorrected position, cuboid level. Measured for brace. +5°, +15°, +20°.

June 20, 1916. Brace and night plaster, massage and exercises. Perfect form and active overcorrection. +45°, +25°, +20°. (See Fig. 5, b).

**CASE 2.** J. O., 252164, male, age one year five months.

*Past History.* Right foot: brace at seven months; plaster at one year, followed by division of plantar fascia, tendo Achillis, and calcaneoscaphoid ligament; plaster.



(a)

FIG. 6.

(b)

- (a) Case 2. Right foot. Photograph ten months after treatment, showing perfect form and active overcorrection.
- (b) Case 5. Left foot. Photograph ten months after treatment. Perfect restoration. Held in voluntary overcorrection.

May 1, 1915. Forefoot adducted, cuboid quite low and prominent, foot cannot be corrected.  $0^{\circ}$ ,  $-40^{\circ}$ ,  $+10^{\circ}$ . Treatment: one walking, three overcorrecting plasters.

August 10, 1915. Well overcorrected, flexible, cuboid up. Brace and night plaster begun.  $+40^{\circ}$ ,  $-10^{\circ}$ ,  $+30^{\circ}$ .

June 6, 1916. Using brace with manipulation. Perfect active and passive overcorrection.  $+45^{\circ}$ ,  $+10^{\circ}$ ,  $+25^{\circ}$ . Photograph June 20, 1916. (Fig. 6, a.)

CASE 3. S. M., 184406, male, three years five months.

*Past History.* Left foot: treatment began at two weeks. At one year division of ligaments and forcible correction. At two years, ether manipulation. At three years, tenotomy.

April 22, 1915. Rigid equino varus, not correctible, os calcis inverted.  $-30^{\circ}$ ,  $-15^{\circ}$ ,  $-20^{\circ}$ . Treatment: two walking, four overcorrecting plasters.

August 31, 1915. Brace applied; foot well overcorrected,  $+5^{\circ}$ ,  $+5^{\circ}$ ,  $+25^{\circ}$ .

December 7, 1915. Actively overcorrected, wearing brace. (Case could not be located after this.)

CASE 4. E. C., 136276, male, age five years nine months.

*Past History.* Both feet: operated at three months, plaster and

braces. At five years, transplantation of tibialis antici into cuboids and bone wedges from astragali.

May 6, 1915. Relapsing type: dorsum prominent, forefeet adducted; not correctible. Right:  $-20^{\circ}$ ,  $-20^{\circ}$ ,  $+5^{\circ}$ . Left:  $-25^{\circ}$ ,  $-10^{\circ}$ ,  $0^{\circ}$ . Treatment: three walking, two overcorrecting plasters.

September 7, 1915. Good overcorrection, cuboids up and heels everted; braces applied. Right:  $0^{\circ}$ ,  $+5^{\circ}$ ,  $+20^{\circ}$ . Left:  $0^{\circ}$ ,  $+10^{\circ}$ ,  $+25^{\circ}$ .

March 21, 1916. Braces and exercises. Right foot held corrected; left, in active overcorrection. Right:  $0^{\circ}$ ,  $0^{\circ}$ ,  $+10^{\circ}$ . Left:  $-10^{\circ}$ ,  $+10^{\circ}$ ,  $+20^{\circ}$ .

CASE 5. A. B., 182646, male, age three years nine months.

*Past History.* Left foot: ether correction at three months; plaster. At nine months, multiple tenotomies, repeated at twenty months and at three years four months; plaster.

May 11, 1915. Relapsing type, cuboid low, forefoot adducted, not correctible.  $-20^{\circ}$ ,  $-35^{\circ}$ ,  $+5^{\circ}$ . Treatment: three walking, two overcorrecting plasters.

August 17, 1915. Well overcorrected, cuboid up. Brace delivered; night plaster, massage, etc.  $+25^{\circ}$ ,  $-15^{\circ}$ ,  $+35^{\circ}$ .

May 22, 1916. Excellent active overcorrection, with normal form and function.  $+35^{\circ}$ ,  $+10^{\circ}$ ,  $+25^{\circ}$ .

June 20, 1916. Photograph (Fig. 6, b).

CASE 6. J. B., 255976, male, age one year three months.

*Past History.* Both feet: at seven months, multiple tenotomies; plaster.

July 13, 1915. Relapsing type; held in varus, barely correctible. Right:  $-10^{\circ}$ ,  $-25^{\circ}$ ,  $-10^{\circ}$ . Left:  $-5^{\circ}$ ,  $0^{\circ}$ ,  $0^{\circ}$ . Treatment: four overcorrecting plasters.

September 28, 1915. Extreme overcorrection. Braces delivered. Right:  $+50^{\circ}$ ,  $+10^{\circ}$ ,  $+20^{\circ}$ . Left:  $+40^{\circ}$ ,  $+10^{\circ}$ ,  $+30^{\circ}$ .

January 11, 1916. Wearing braces; feet easily overcorrectible and in excellent form and function. (Case could not be located after this.)

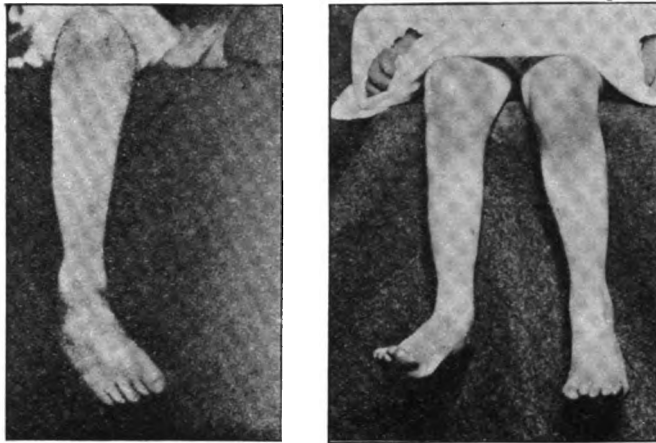
CASE 7. W. E. L., 188054, male, age three years nine months.

*Past History.* Left foot: ether manipulations at three months. Tenotomies at thirteen months, two years five months, and two years eight months.

August 24, 1915. Equino varus; rigid, non-correctible; os calcis elevated and inverted, cuboid low with callus.  $-20^{\circ}$ ,  $-25^{\circ}$ ,  $-20^{\circ}$ . Treatment: seven walking plasters, one overcorrecting plaster.

December 21, 1915. Easily overcorrectible.  $+15^{\circ}$ ,  $0^{\circ}$ ,  $+15^{\circ}$ .

June 6, 1916. Good form and active overcorrection.  $+25^{\circ}$ ,  $+5^{\circ}$ ,  $+25^{\circ}$ . Photograph in brace (Fig. 3).



(a)

FIG. 7.

(b)

**CASE 8. Right foot.**

(a) Photograph Nov. 16, 1915, before treatment, showing inversion and adduction of foot, not correctible.

(b) Photograph June 6, 1916, three months after treatment. Foot restored to normal shape and held overcorrected by peroneal spasm.

**CASE 8. M. M., 284422, female, age five years.**

*Past History.* Right foot: operated at three months. No treatment for two years.

November 16, 1915. Equino varus; marked adduction and inversion of forefoot. Cuboid low with callus; not correctible.  $-20^{\circ}$ ,  $-40^{\circ}$ ,  $-35^{\circ}$ . Photograph (Fig. 7, a). Treatment: four walking, two overcorrecting plasters.

March 21, 1916. Brace; active overcorrection.  $+10^{\circ}$ ,  $+20^{\circ}$ ,  $0^{\circ}$ .

June 6, 1916. Overactive overcorrection; potentially pronated with peroneal spasm. To omit brace.  $+10^{\circ}$ ,  $+20^{\circ}$ ,  $+10^{\circ}$ . Photograph (Fig. 7, b).

**CASE 9. W. L., 241087, male, age two years.**

*Past History.* Left foot: tenotomies at five months; then no treatment.

November 23, 1915. Equino varus, cuboid low, heel inverted; not correctible.  $-5^{\circ}$ ,  $-20^{\circ}$ ,  $-10^{\circ}$ . Treatment: eight walking, two overcorrecting plasters.

May 9, 1916. Overcorrected; cuboid up and heel everted. Night and day braces, massage, etc.  $+20^{\circ}$ ,  $-5^{\circ}$ ,  $+30^{\circ}$ . Photograph June 20, 1916 (Fig. 8, a).

**CASE 10. L. R., 285568, male, age one year five months.**

*Past History.* Right foot: tenotomies at one year; plaster.



(a)

(b)

FIG. 8.

- (a) Case 9. Left. foot. Photograph June 20, 1916, six weeks after treatment. Normal foot.
- (b) Case 10. Right foot. Photograph June 6, 1916, two months after treatment. Perfect form and function.

November 30, 1915. Cuboid low, heel inverted, marked adduction; not correctible. — 20°, — 40°, — 40°. Treatment: three walking, two overcorrecting plasters.

April 18, 1916. Extreme overcorrection; braces. + 30°, + 20°, + 30°.

June 6, 1916. Excellent form and function. + 20°, + 20°, + 20°. Photograph (Fig. 8, b).

It may, of course, be said of the foregoing cases that they do not represent the most difficult club-feet, such as absolutely untreated cases of adolescent or adult age. While this is undoubtedly true, it is the writer's opinion that, owing to their condition and rigidity, they do represent in a practical manner most of the difficulties of the more severe types, and certainly serve as a test of the method advocated. It is at least evident that the application of thoroughly conservative methods, without sacrifice of structure or action, and the accomplishment of perfect results in rigid relapsed club-feet, are in no way incompatible.

#### REFERENCES.

- <sup>1</sup> FISKE, EBEN W.: "The Prognosis of Congenital Club-Foot, and Its Relation to Non-Operative Treatment," *Journal A. M. A.*, July 31, 1915, pp. 375-380.
- <sup>2</sup> Heusner's glue:
- |                 |        |                      |        |
|-----------------|--------|----------------------|--------|
| R Alcohol ..... | 50 cc. | Resin .....          | 50 gm. |
| Benzine .....   | 25 cc. | Venice turpentine... | 5 gm.  |
- <sup>3</sup> EHRENFRIED, A.: *Boston Med. and Surg. Jour.*, 1909, clix, p. 741.

## DIRECT NEUROTIZATION OF PARALYZED MUSCLES: FURTHER STUDY OF THE QUESTION OF DIRECT NERVE IMPLANTATION.

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THE object of this paper is essentially to study the boundaries of physiological nerve regeneration under certain conditions, and secondarily, to look for the possible clinical applications of physiological facts to pathological conditions, similar to those created in the experiments.

Until very recently the following were the generally accepted facts concerning this problem:

In the divided peripheral nerve, the central part of the axon only is regenerating, while the peripheral end acts merely as a neuro-conductive scaffold which receives the new axons as they grow out of the central stump.

A gap at the place of severance can be bridged only if short, otherwise, the sprouting axons fail to connect with the peripheral stump.

Interposed scar or other tissue furnishes a most serious obstacle to regeneration, and its removal is, therefore, very essential in nerve surgery. Yet, a complete regeneration for a long distance and after many years may be expected after accurate adaptation of the nerve ends. Clinical observations show that the new formed nerve elements finally reach the individual muscle cell through the above described channels, and form end-organs, thus completely re-establishing the normal neuromotor connections.

It has also been observed that free regeneration may take place for a very short distance outside the nerve sheaths in the loose connective tissue. The most persistent and efficient progress, however, is made within the structure of the peripheral nerve end, and considerable distance may be covered in this way by the regenerating nerve.

In fact, this has heretofore been considered as the only path upon which regeneration of peripheral nerves may serve any practical purpose.

In 1914 Heineke first pointed out the possibility of implanting peripheral nerves directly into paralyzed muscle tissue. Erlacher and others have studied this problem from various angles experimentally, and sporadic attempts have been made by Guersuny and others to find a field for clinical application.

Heineke maintains from his experiments that motor impulses can in this way be directly transmitted to the muscle. This could be possible



only if the nerve fiber upon reaching the sarcolemma of the muscle cell produces the terminal ramification of the axis cylinder down to the delicate end plates and bulbs. In other words, the normal contact between nerve and muscle fiber would have to be entirely reproduced by regeneration outside and independently of the old preformed structure.

A further step was taken by Erlacher in maintaining the possibility of neurotizing the paralyzed muscles by means of direct contact between normal and paralyzed muscle, and without the implantation of the peripheral nerve.

Guersuny attempted clinically the re-neurotization of the paralyzed deltoid muscle by covering it with a pedunculated flap from the cucullaris muscle after extensive scarification of the muscle surfaces. It is, furthermore, asserted by this author that additional nerve supply could be transmitted to a healthy and normally supplied muscle, by implanting an additional peripheral nerve into the muscle tissue. This so-called hyper-neurotization was carried out by Erlacher in eight experiments on guinea pigs. Twenty-eight days after operation the muscle could be stimulated by the faradization of the implanted nerve.

In a preliminary report regarding this problem, I pointed to the method of direct nerve implantation as a possibility, *i.e.*, that the conveyance of motor impulses could possibly be transmitted in this way through physiological channels. My observations, made in a series of experiments on dogs, were, however, not conclusive, as many technical difficulties had interfered with a clear demonstration of this fact. Since then the continued work along both experimental and anatomical lines has brought out certain facts with a considerable amount of certainty, and I take pleasure in submitting to you, herewith, in detail my observations and conclusions.

I gratefully acknowledge in the first place the very valuable co-operation of Dr. H. L. Beye, of the department of surgery of the State University of Iowa in assisting me in my animal experiments; Dr. McEwen, of the anatomical department of the University; Dr. Royce, pathologist of the University Hospital; Dr. Grover, of the department of pathology; and Mr. Schlomovitz, of the department of pharmacology, have also greatly aided me in my work.

#### EXPERIMENTAL FINDINGS.

The following is an abstract of the experimental work on animals in which a series of dogs and cats was used. The technic applied was as follows: First, an incision was made along the femoral vessels and

the anterior crural nerve was dissected. It was then divided at a point well above the level of the upper muscle branches and a distance from one to one and one-half inches was resected. The central end was then turned upward and fastened securely into the muscles of the abdominal wall, in order to prevent the regeneration of the anterior crural nerve. Then a posterior incision was made along the posterior border of the glutei, and the sciatic nerve was dissected. One can see this nerve distinctly divided into two bundles, of which the upper corresponds to the anterior and the lower to the posterior tibial nerve. The anterior tibial bundle was then spliced off and cut low enough to leave a central end of sufficient length. This end was then brought forward through a tunnel in the muscles and, after refreshing the cut, was directly implanted into the vastus externus muscle. Here it was held securely by fine catgut sutures. The wound was sewed with catgut and silkworm gut and covered with tincture of benzoin.

1. Dog 4. Operated Oct. 26, 1915. Technic as described. Jan. 11, 1916, re-examination and sacrifice of dog 10 weeks after operation. Upon stimulation of the implanted branch of the sciatic nerve with weak faradic currents a contraction of the vastus externus muscle is distinctly noticed. The anterior incision is then reopened and the vastus externus muscle is exposed. The muscle contracts very distinctly whenever the implanted nerve is stimulated with weak currents, weak enough not to cause any retrograde stimulation to the flexors. This isolated contraction is, furthermore, most evident in muscle parts immediately surrounding the place of implantation, while the more remote parts respond to stronger currents only. The implanted nerve is then carefully dissected by following its course through the muscle tunnel. At the point of implantation the nerve is splitting up into several branches showing the reddish appearance of new formed nerve tissue (Fig. 1). The peripheral parts of the muscle are paler than the center around the implantation. The nerve-muscle specimen is carefully removed for microscopical examination. Then the anterior crural nerve is re-examined. The central end is found adherent to the abdominal wall to which it had been fastened. No regeneration of this nerve had apparently taken place as there is no evidence of ramification. It is especially noted that no contraction of the abdominal muscles follows the faradic stimulation of this nerve. This seems significant, inasmuch as it renders the question of hyperneurotization more problematic, as has been intimated in my previous report.

2. Dog 10. Operated Nov. 2, 1915. Technic as above. Re-examined Dec. 31, 1915. The main trunk of the sciatic nerve reacts to weak currents. The implanted branch does not react to weak currents, but



FIG. 1. Dog 4.  
Ten weeks after neurotization. Specimen shows the ramifications of the implanted branch of sciatic nerve.

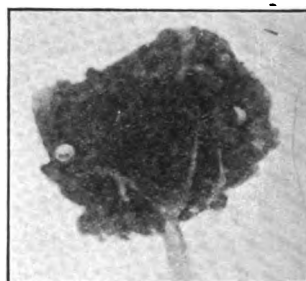


FIG. 2. Dog 10.  
Eleven weeks after operation. Specimen shows the implanted sciatic branch with ramifications descending into the vastus externus muscle.

on application of stronger currents the vastus externus is seen to contract in the area around the place of implantation, while the rest of muscle remains apparently inactive.

Jan. 18, 1916. Reoperation and sacrifice of dog 11 weeks after operation. Upon reopening of the posterior incision the anterior tibial branch is seen to disappear in the tissue of the vastus externus. Faradization of this branch with weak currents shows now powerful contraction of the extensors, especially of the vastus externus, resulting in forceful and active extension of the knee. Contraction on direct faradic stimulation is obtained in equal measure in the vastus externus and in the normal gluteal muscles. The nerve is then followed up through the muscle tunnel. As it reaches the vastus externus, it splits up into several branches and disappears in the tissue. (Fig. 2.) The rectus femoris muscle also shows active contractility, but less energetic than that of the vastus. Its color is less vivid. It can be stimulated from the implanted nerve, but stronger currents are necessary. Then the central stump of the resected femoral nerve is exposed. It has grown fast to the muscles of the abdominal wall, but its stimulation does not cause any contraction of the muscles. This, again, is in keeping with former experiences in failing to show hyperneurotization.

On the other hand, it is noticed that a number of very fine branches have regenerated from the central stump of the femoral nerve, in spite of the precautions taken against regeneration. These branches have succeeded in making connection with the extreme upper segment of the vastus externus. Faradization of these branches with strong currents produce a very slight and inert contraction of the muscle in this

area. In contrast to this the contraction produced by faradization of the implanted branch is prompt, forceful, entirely normal and requires only the weakest currents.

It is, therefore, evident that reinnervation and regeneration of the muscle has been accomplished from two sources: first, by the implanted anterior tibial; and second, to a much smaller degree, by very fine, regenerated filaments of the anterior crural, these latter, however, supplying only a small part of the muscle. It may be assumed that the paralyzed muscle acting as chemotactic stimulus for nerve regeneration, could be neurotized so much more readily by the already implanted branch than by the deflected stump of the femoral nerve, with the result that a larger part of the muscle had already taken up its supply of nerve tissue before the slowly regenerating branches of the femoral were able to establish connections.

3. Dog 11. Operated Nov. 9, 1915. Technic as above. Jan. 7, 1916, reoperated and sacrificed. Faradization of the implanted nerve with somewhat stronger currents causes contraction of the vastus externus. The contraction is distinctly slower and less energetic than the one seen in the normal muscles upon stimulation of the main trunk of the sciatic nerve. Direct faradization of the vastus externus gives slow and irregular contraction. Here, also, is the threshold of faradic irritability markedly higher than in the normal muscle. The anatomical specimen (Fig. 3) shows distinct ramification of the implanted nerve before it disappears in the muscle tissue.

This case shows the re-establishment of neuromotor contact to be incomplete. Hardly eight weeks had elapsed from the time of implantation, a time hardly sufficient for the completion of regeneration. The signs of beginning reneurotization are, however, unmistakable.

4. Dog 3. Operated Nov. 30, 1915. Technic as above. Re-examined Dec. 28, 1915. The implanted nerve branch does not respond to faradic stimulation with any muscle contraction. The anatomical specimen shows already a branching out of the nerve. The time, four weeks since operation, is evidently too short for the formation of terminal fibers and end-organs.

5. Dog 0. Operated Dec. 14, 1915. In this instance the femoral nerve was resected as usual, but instead of implanting a sciatic branch, a muscle-to-muscle attachment was carried out by taking a large flap with central base from the gluteal muscles and attaching it to the vastus externus and rectus femoris muscles. After the corresponding surfaces had been scarified, the muscles were united with catgut sutures. The dog died 4 weeks later from unknown causes. From the anatomical specimen no information could be gained in regard to the



FIG. 3. Dog 11.  
Eight weeks after nerve implantation.  
Specimen shows distinct ramification  
of the implanted nerve.



FIG. 4. CAT 1.  
Specimen shows the splitting up of the  
implanted nerve.

merits of this method. The broad base of the attachment had been drawn out into a small fibrous band, which seemed to contain no muscular elements.

6. Cat 1. Operated Nov. 19, 1915. Technic as applied in the dog series. This cat, too, died from unknown causes seven weeks after operation. No physiological test could, therefore, be made, but the specimen (Fig. 4) shows distinctly the ramifications of the implanted nerve.

7. Cat 2. Operated Nov. 26, 1915. Technic as above. Jan. 14, 1916, reoperated and sacrificed. The faradization of the implanted nerve is still negative, even if strong currents are applied, the time elapsed being only less than seven weeks. Direct faradization of the vastus externus, however, shows the following phenomenon, similar to that observed in dog 4. The peripheral parts of the muscle contract slowly with inert, undulating waves; as one approaches more the place of implantation, these contractions become decidedly more active, until they appear to be normal. The currents necessary for stimulation are somewhat stronger than in the normal. This observation shows that a differentiation is taking place in the muscle receiving the nerve implant; regeneration progresses centrifugally from the place of implantation.



FIG. 5.

Normal human muscle. Microphotograph showing arrangements of nerve filaments. Note cross striation of muscles.

#### HISTOLOGICAL FINDINGS.

In order to interpret properly the histological evidence, uniform methods of staining were applied, both in the teased specimens and in the sections. For the demonstration of nerve endings in fresh muscle specimens, a mixture of 1% gold chlorid and formic acid (4 to 1) was prepared and small pieces of muscle placed in it for one hour. They were then washed, placed again in 25% formic acid for 24 to 48 hours and then kept in 70% alcohol for a few days. Teased in glycerine and mounted.

Normal muscle fibers show an abundant reticulum of dark-stained nerve fibers surrounding the individual muscle fiber. Larger nerve fibers are often seen to cross transversely over a bundle of muscle fibers,



FIG. 6. Dog 4.

Regenerated vastus externus. Microphotograph. Specimen shows the regenerated nerve fibers and muscle fibers. Note especially the beautiful cross striation.

and then turn in longitudinal direction to branch off into their terminal filaments. Occasionally one finds terminal end plates, though they are not easily demonstrated by this method. (Fig. 5).

The totally paralyzed muscle shows above all complete disintegration of the individual muscle cell. There is no trace of transverse striation and the longitudinal fibrils or sarcostyles are irregular and broken up in short rudiments.

#### RENEUROTIZED MUSCLE.

According to Erlacher the degeneration of muscle and neuron follows very quickly the paralyzation of the muscle. The motor end plates degenerate and disappear as early as three to five days after



FIG. 7.

Muscle fibres from paralyzed gastrocnemius. Specimen shows apparently healthy fibers with longitudinal striation and ample nerve supply.

the operation. Previous experiments show that upon dissection of the motor nerve, degeneration of the muscle elements also ensues very quickly, that is, simultaneously or even prior to the disintegration of the nerve element. Regeneration, in turn, starts from two to six weeks after the nerve section, first forming the nervous end ramifications, which is then followed by regeneration of muscle fibers.

Eight weeks after neurotization there is no trace left of the defibrillation of the muscle fiber. The sarcostyles are again arranged in compact alignment. (Fig. 6.) The contour of the fibers is entirely regular. Distinct longitudinal striation and occasional transverse striation can be seen. There is also an abundance of well stained terminal nerve filaments. They are arranged in a beautiful network ensheathing the muscle.

#### PARALYZED HUMAN AND INFANTILE PARALYSIS.

A good deal of attention was paid to the examination of apparently paralyzed muscles in infantile paralysis. The state of these muscles was



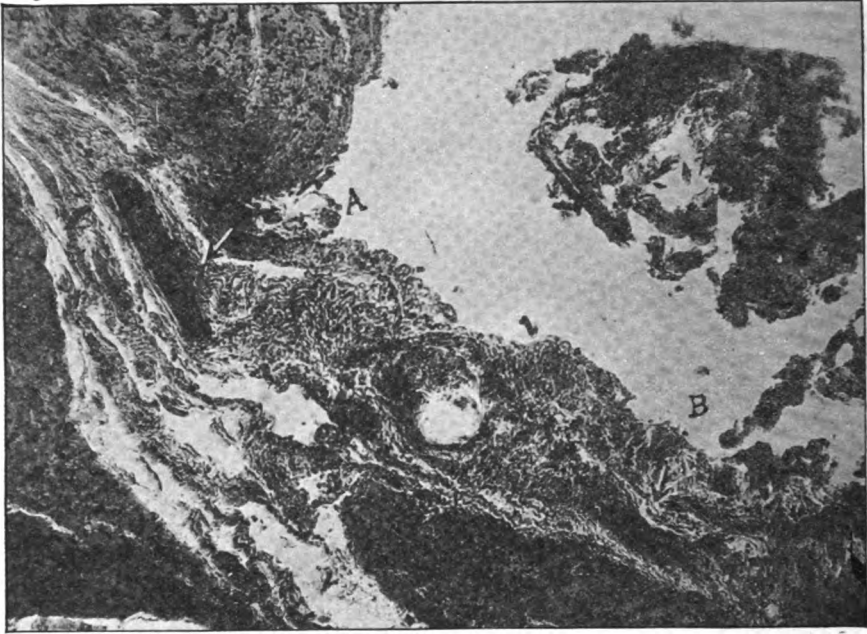


FIG. 8. Dog 3.

Four weeks after neurotization. Microphotograph; low power. The slide shows a distinct nerve bundle in upper left quadrant, and a shorter one in right lower (A, B). In this case the bundles are larger, but no finer ramification could be traced in the sections.



FIG. 10. Dog 4.

Low power. Note small nerve in septum sending off branch crossing a number of muscle fibers.

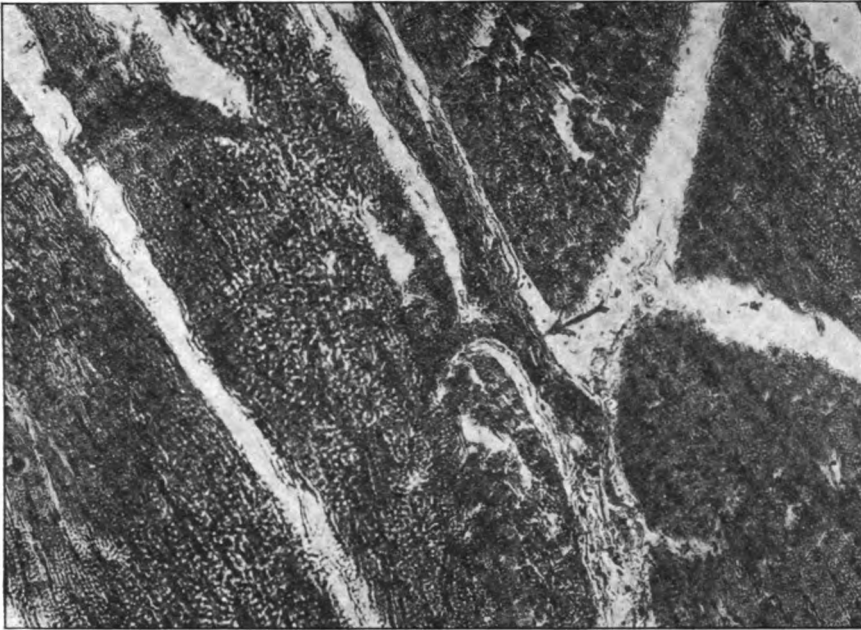


FIG. 9. Dog 4.

Ten weeks after neurotization. Microphotograph. Low power. Note the bundle branching off a larger nerve and entering into muscle bundle.

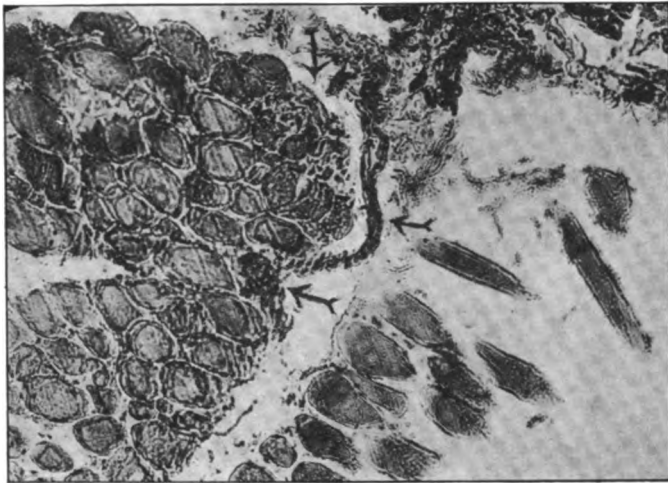


FIG. 11. Dog 10.

Eleven weeks after neurotization. Note small nerve and cross sections of nerve bundles actually within endomysium in close connection to sarcolemma and muscle cell.

such that our present indications of operative treatment would have eliminated them by transplantation methods. We find a great deal of degenerative changes in the muscle fibers, loss of transverse as well as cross striation, irregularity of contours, defibrillation, and so on. But among this degenerated muscle substance there is also a considerable number of apparently normal muscle cells. (Fig. 7.) They show terminal nerve reticulum, longitudinal and, in places, even cross striation. These fibers surely did not take part in the degeneration, and we must assume that there is a variable amount of healthy muscle tissue in supposedly totally paralyzed muscles.

From the specimens obtained from dogs 3, 4, 10 and 11, and cat 2, series of sections were prepared. The hematoxylineosin stain was found equally serviceable and less complicated than Pal-Weigert's method, though the latter is a specific myelin stain. The nerve bundles appear very distinctly in their more or less heavy perineural sheath, characterized by their wavy and regular fibrillar structure, with the nuclei of the neurilemma stained in beautiful blue.

As one follows the entrance of the nerve into the muscle tissue, the ramification of the main trunk into smaller bundles becomes very apparent. The larger strands are accompanied in their course along the muscle septa by ample connective tissue. At a lower level they can be seen to enter the endomysium in slender tracts, which are now in much closer contact with the muscle cells, and finally lose themselves between the individual muscle fibers.

In longitudinal sections this distribution may be followed up distinctly, and it is very interesting to see the nerve leave the intramuscular septa until the finest bundles find their way into the endomysium. Here and there single nerve fibers may be seen running for a short distance between individual muscle cells. (Figs. 8, 9, 10, 11.) As far as I could trace in the sections the terminal ramifications were much more complete in dogs 4, 10 and 11 than in the other animals, conforming with the previous observation that in these instances much better reaction was obtained by faradization. In dog 3 and cat 2, I do not think that the time was sufficient for complete restoration of the normal neuro-motor contact.

Summarizing these observations, I believe that reasonable proof has been furnished to maintain the following points:

1. Direct neurotization, in the sense of Heineke and Erlacher, is indeed possible. The natural limits of physiological regeneration allow a motor nerve, directly implanted into paralyzed muscle tissue, to estab-

lish by regeneration the entire chain of neuro-motor connections. From the experiments it appears that this regeneration becomes complete in from eight to ten weeks after the implantation.

2. In close succession to the regeneration of nerve tissue, the muscle tissue also regenerates, and this becomes manifest in the reappearance of the normal contours of the fibers and the normal striations.

3. Physiological test of the reneurotized muscles also shows that regeneration of the muscle takes place centrifugally from the point of implantation.

4. In none of the experiments could we observe in a normal muscle any inclination to take on additional nerve supply, though ample occasion was furnished to this effect. For this reason I am inclined to be rather skeptical in regard to the question of hyper-neurotization.

5. Apparently totally paralyzed muscles in infantile paralysis were regularly found to contain a variable number of perfectly normal muscle fibers and a considerable amount of nervous elements.

In regard to the clinical applicability of these facts to cases of infantile and other paralysis, a definite statement should, I think, be withheld until one or two more points are more clearly understood.

Above all, it would seem necessary to determine to what extent this faculty of terminal regeneration is affected by the length of time after onset of paralysis, the later anatomical change in the paralyzed muscle being such as to preclude any possible regeneration. The problem evidently centers in the regenerative faculties of the paralyzed muscle which receives the nerve implant. The finding of considerable amount of healthy muscle tissue in muscles which had been paralyzed for years offers a strong possibility for the clinical application of this principle.

Investigations in this direction are under way.

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## THE INFLUENCE OF THE OS CALCIS ON THE PRODUCTION AND CORRECTION OF VALGUS DEFORMITIES OF THE FOOT.

BY PERCY WILLARD ROBERTS, M.D., NEW YORK.

IN the literature on lateral deformities of the foot little consideration has been accorded the os calcis as a basic factor in the etiology of weak foot and certain types of paralytic valgus. Nevertheless, a careful survey of the subject leads to the conclusion that many of these malpositions are in a great measure due to the shape of the under-bearing surface of this bone. So clearly does this appear upon experimental and clinical observation, that it is well within the limits of conservatism to say that were it not for the globular contour of the inferior bearing surface of the os calcis, other factors contributing to the production of valgus feet would often become inoperative. In other words, if the under surface of the bone was flat instead of round, many valgus deformities would never occur, but freedom from such conditions would be obtained at the expense of great loss in the foot's flexibility.

The importance of the os calcis as a fundamental factor in foot strain, and as a medium through which symptoms and deformities may be controlled, is due both to its shape and its intimate ligamentous union to the rest of the tarsus. In a normal subject it is impossible to transpose the strain from one border of the foot to the other without some rotation of the os calcis and, conversely, it is impossible to rotate the os calcis without increasing the stress upon that border of the foot toward which the superior aspect of the bone tilts.

When a skeleton of the foot is placed on a plane surface, the bearing area of the os calcis is seen to be extremely small, scarcely more than that of a ball resting upon a table. If now a cross section of the bone be made at its point of contact, it becomes apparent that whatever weight may be borne by the os calcis is in reality resting on a body with an arc for its base (Fig. 1), and herein lies the principle involved in this exposition. There is an axiom in mechanics that a body with an arc for its base can bear a superimposed weight without tilting only when the thrust of that weight is received over the center of balance, and that when received away from the center it will tilt in proportion to the force of the thrust and the distance from the center at which it is applied (Fig. 2).

So long as the weight of the body is carried over the center of balance of the os calcis or to the outer side of the center, throwing the



FIG. 1.

Cross-section of os calcis at point of contact when resting on a plane surface. Note the arc-like form of its under bearing surface.

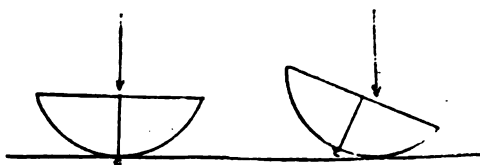


FIG. 2.

Diagram illustrating the effect of a thrust over the center of balance and away from it on a body with an arc for its base.

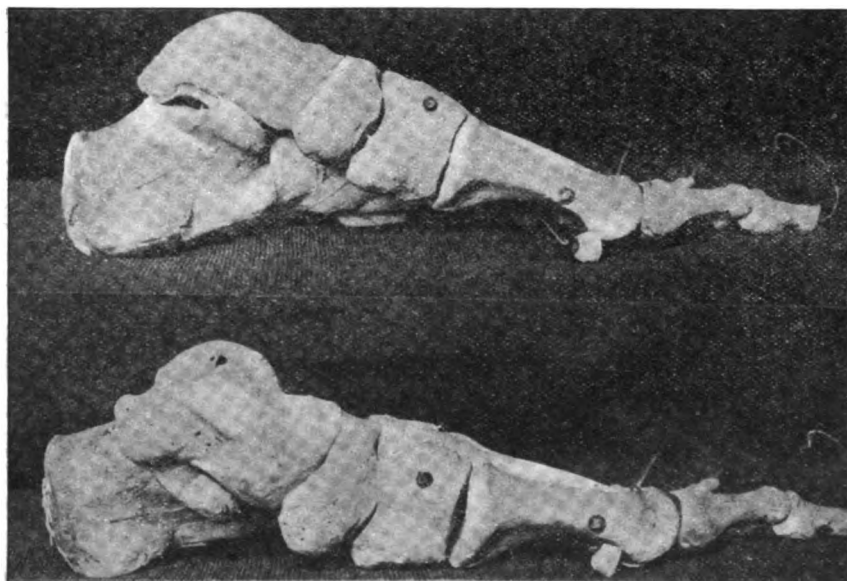


FIG. 3.

Skeleton of foot in the normal position (above) and with os calcis rotated (below). Note in the lower figure the depression of the astragalus, scaphoid and internal cuneiform bones and the lack of anterior tilting of the os calcis.



FIG. 4.

Plantar surface of foot (from Gray's Anatomy). Note the strong ligaments on the outer half of the foot binding the os calcis to the bones lying anterior to it and the relatively small ligaments on the inner half.

weight upon the strong and well-supported outer border of the foot, no strain upon the longitudinal arch occurs. However, in the "attitude of rest," described by Annandale many years ago, and since copied into various text-books, the feet are everted, the leg muscles are relaxed, the astragalus glides forward and inward on the os calcis, to be locked in this position by the contour of the bones and the resistance of the ligaments. This shifts the thrust of the superimposed weight to the inner side of the center of balance of the os calcis, tilting the bone laterally, thereby transposing the strain from the outer to the inner border of the foot and depressing the arch (Fig. 3). Recalling the anatomy of the deep structures of the plantar surface of the foot (Fig. 4), it will be noted that the ligaments of the inner half are relatively small. If subjected to overload for a considerable period of time, they stretch, and eventually allow a sagging of the arch. Thus occurs the initial step in the production of weak-foot. It is true that during this period the tibialis anticus and the tibialis posticus are able to restore the arch while the foot is in action, but continuation of the strain while standing is likely to impair these muscles, unless they are especially developed, and the pronation of the attitude of rest then becomes a fixed deformity. Thus it is clear why really flat-feet occur so frequently in men whose

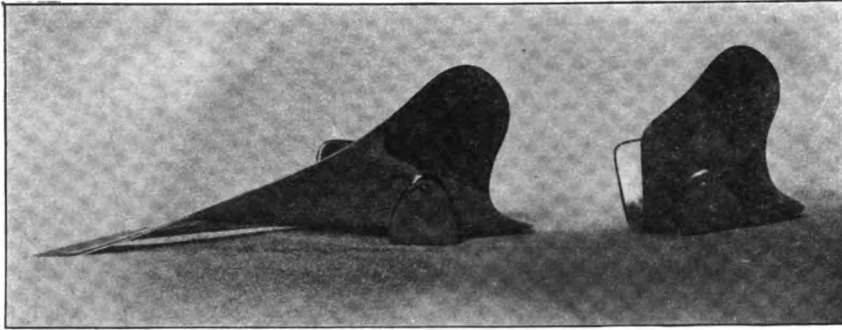


FIG. 5.

The original small plate and the long plate now in use. Note that the flange bears chiefly against the posterior half of the os calcis.

occupations necessitate long hours of standing, It is not so much the weight the feet are called upon to bear as the position of the os calcis, which produces deformity, for if the thrust of the weight came over the center of balance of the bone, or outside of the center, there would be no undue strain upon the arch. Therefore it may be said that with the os calcis in proper position, that is, receiving the thrust of its burden to the outer side of the center of balance, the greater the weight to be borne the less likelihood is there of producing flat-foot, unless the load becomes sufficiently heavy to stretch the inferior ligaments and allow anterior tilting of the bone.

The influence of the os calcis on the rest of the foot may well be applied both surgically and mechanically, in controlling deformity. In moderate paralytic varus, for instance, the center of balance can be changed by shortening the outer border of the bone through removal of a longitudinal wedge and approximating the fresh surfaces, thus throwing the body weight to the inner side of the foot, and overcoming the constant pull of the tibialis anticus. Several cases treated in this way have given satisfactory results. The milder forms of valgus might be benefited by a similar operation on the inner side of the bone, but these cases can be easily controlled by a plate which the writer devised in 1914, for the relief of both weak feet and moderate paralytic valgus, to which your attention is especially called. The principle involved in this apparatus varies from that of others, inasmuch as it seeks to overcome both foot strain and valgus deformity through rotation of the os calcis without exerting appreciable pressure under the arch. In its original form (Fig. 5) it consisted of a small plate extending only to the anterior





FIG. 6.

Posterior view of a case of severe flat-foot. Note the bulging at the astragalo-scapoid joint and the outline of the tendo Achillis.



FIG. 7.

Case shown in Fig. 6. Note the effect of the plates in rotating the os calcis, obliterating the bulge at the astragalo-scapoid joint and straightening the tendo Achillis.

border of the os calcis. Its floor was tilted upward on the inner side and a flange extended backward to the posterior and upper border of the inner side of the heel. Just below this the metal was bulged to allow room for the soft parts when the heel was rotated. A flange on the outer side prevented slipping laterally. The effect of this plate was to grasp the os calcis firmly, rotate its superior surface outwards, thus carrying up the arch of the foot and transferring strain to its outer border. Later the plate was modified by extending its floor forward to support the transverse arch, and in this form it is now used. The efficiency of the device has been proved in more than 300 cases in which it has been applied, and failure to secure relief of symptoms has been exceedingly rare. It appears to be suitable for all cases of flexible weak feet unless the ligaments have been stretched to a point where rotation of the os calcis fails to carry the rest of the foot with it. Moderate cases of paralytic valgus may be almost entirely controlled in this way, and in cases of weak-foot accompanied by metatarsalgia the results have been most satisfactory.

The advantages of such a plate are numerous. First of all, it corrects the malposition of the bone on which deformity depends, and no permanent results can be expected until this is accomplished. It restores the arch without producing great pressure under it, leaving the plantar tissues free to develop in strength. It occupies less space in the forward part of the shoe than other plates, and because of its form is less destructive to soft leather. It provides support for the anterior

arch, as well as relieving the longitudinal span, and owing to the lack of great strain on the plate forward of the heel, it is not subject to breakage.

In conclusion it may be urged that the influence of the os calcis on lateral deformities of the foot is deserving of more consideration than it has heretofore received, for through control of this bone much may be accomplished in the prevention and correction of malpositions and in the relief of symptoms which so frequently ensue.

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### SCOLIOSIS: ETIOLOGY AND TREATMENT.

BY FRANK E. PECKHAM, M.D., PROVIDENCE, R. I.

In a pronounced scoliosis, the spinal column is deviated either by a total curve or by two or three curves, one being compensatory to another. In order for this condition to exist, there must of necessity have been a softening of the bones (vertebral bodies) and also a corresponding laxness of the ligaments and soft structures. Now the etiological factor is the process which causes this softening and relaxation of the various structures.

According to Gourdon and Dijonneau, "Infection and intoxication dominate all bone pathology." According to Denucé, "All scolioses of a grave form depend upon a cause susceptible of producing an inflammatory or sub-inflammatory condition changing the resistance of the bony vertebral tissues and thus modifying the dynamic condition of the vertebral column." LaGrange claims that "without this loss of resistance all the faulty positions which children so commonly assume could have no effect in causing spinal deviation."

In a healthy child, the muscles and all soft structures have a normal tonicity, the bony structures a normal density, and a normal rate of growth usually takes place. Underhill, in "The Physiology of the Amino Acids," says: "The albuminoids are simple proteins characterized by great insolubility in all neutral solvents and may be found as the organic basis of bone (osseine), of tendon (collagen and its hydration product, gelatin), of ligament (elastin), and of nails, horns, hoofs, and feathers (keratins)." Again, "Glucoproteins are compounds of the protein molecule with a substance or substances containing a carbohydrate group other than a nucleic acid. Particularly rich in glucoproteins are the mucus-yielding portions of tissues. They serve also as a cement substance in holding together the fibres in tendons and ligaments."

It will thus be seen that there is a common groundwork in bones, tendons, and ligaments, held together, in a way, by a cement common to them all. If, for any reason, either or all of these factors are interfered with, there results a disarrangement of the physiological processes in such a way that the bones and even the cerebral tissue is deprived of calcium, and the soft structures (muscles and ligaments) become markedly lax. Among the diseases and conditions which produce such results are hypothyroidism, rhachitis, infections (including auto-intoxication), rapid growth (adolescence), and others.

Too much attention has been given to individual vertebrae and the angular bendings of the ribs. When the spinal column as an entity is considered, it is easy to see what happens under these abnormal conditions. Let us consider, for example, what happens in a case of hypothyroidism. The physiologists tell us that in this condition, the calcium salts are escaping from the system too rapidly. As a result, the bones are very much softened and all the soft structures are very much relaxed, i.e., their tonicity is all gone. It is the function of the spinal column, in its entirety, to support the head and trunk. Imagine for a moment all this body weight pressing down upon such a weakened and relaxed structure. We are all familiar, for example, with the mechanical condition in a knock-knee. Knock-knee is a rhachitic deformity, and the ligaments of such a knee joint are so lax that there is a marked degree of lateral mobility, so that the knee is bulged inward by the downward force of the superincumbent body weight. A similar laxness of ligaments exists all around the spinal column under the conditions described above. The body weight coming down upon such a structure pushes the vertebrae downward. The holding ligaments stretch and yield. Thus the vertebrae are crowded not only downward, but off to one side or the other. Being held, as one might almost say, in a closed sac, as one section of the vertebral column is pushed off one way, the next lower section must of necessity go the other way, if not at first, then later. This would seem to be an explanation of *deformity formation*.

For *deformity correction*, just the opposite mechanics must be applied. The settling or shortening of the spine, as a result of body weight pressing downward, must be overcome by a lengthening of the spine and, as much as possible, removal of the body weight. This can be done by putting the patient in a flexed position, face down, with the body evenly supported over a curved frame. Then traction may be made both at the head and at the feet, thus lengthening the spine an additional amount. Also lateral and rotary pulls may be made, thus untwisting

still more. With the patient in this position, correction may be comparatively easy, and a plaster jacket may be applied. However, when the patient assumes the upright position, immediately the superincumbent body weight is at work again with its downward force, and the encircling plaster of Paris is so far removed from the spine that it fails to hold the corrected position. With careful attention to details in getting the patient into position and adjusting the traction and lateral pulls, a noticeable correction may be obtained after the standing position has been assumed, as evidenced by an X-ray picture.

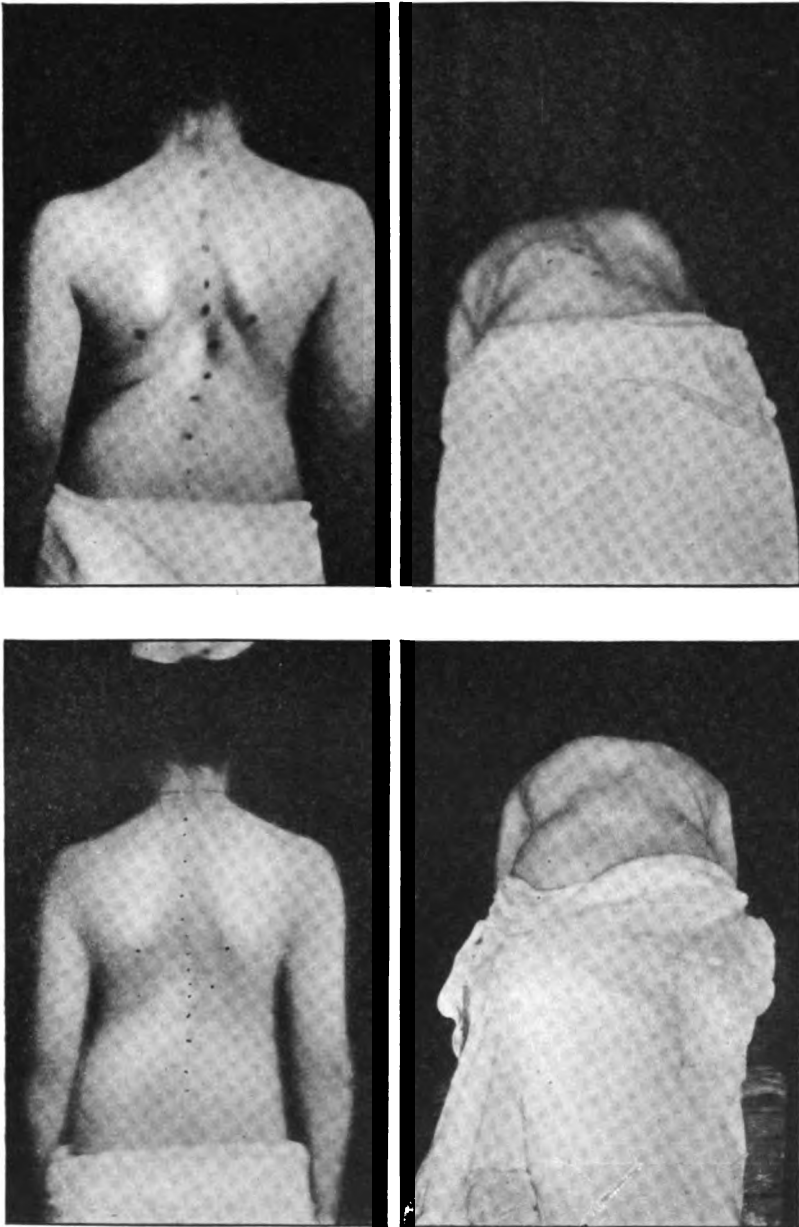
In a case of Pott's disease, the deformity is mostly a posterior one, so that the plaster jacket, which is almost in contact with the spinous processes, prevents, to a certain extent, the kyphos formation, but in a scoliosis, the deformity is a lateral and a twisting one, against which the plaster of Paris cannot be very closely applied. Even in a Pott's disease, if the deformity is mid-dorsal or higher, the head should be supported to prevent somewhat the downward pressure of body weight. In a corrective jacket applied for scoliosis, there is ordinarily no head support or rather no arrangement to make traction upward from the head. To have perfectly efficient mechanics, this would be necessary in an ambulatory case, to prevent the downward pressure of the body weight, which is the force producing the deformity, and the removal of this force would as certainly prevent deformity formation.

As will be shown, it may be an easy matter with the patient in position on the frame, to obtain a straight spine, proved by an X-ray, but when the standing or upright position is assumed, the downward force of the body weight becomes immediately active and deformity recurs. If the patient could be held in the reclining position on the frame with body weight off, while the true etiological (physiological) factor was remedied and the bones and ligaments restored as regards density and tonicity, then would the real cure be obtained. This is, however, not feasible, and the proper physiological (etiological) treatment has not been made much of as yet.

In the cases which have been studied in my work, the patients have been ambulatory, either going to school or working all day in the shop, and hence no attempt has been made to use head traction, and no case has been retained in the reclining position on the frame. Although mechanical treatment is of importance, I think the etiological factor so far has been neglected, and it would seem that this matter should be taken up immediately because it is of the utmost importance, particularly if the patients can be observed and treated in the early stages.

The first class of cases which I wish to describe is that of hypothyroidism with scoliosis. A concrete case was that of a girl, now ten years old, who had Pott's disease when a baby and was treated on a hyper-extended frame for about three years with, so far, no recurrence. The X-ray shows one mid-dorsal vertebral body nearly completely destroyed with the one above and one below partially destroyed. Clinically, there was a slight deformity only, and that a slight lateral deviation. In the fall of 1914, the child was brought to me again with a beginning lateral deviation of the spine. A plaster jacket was applied and worn through the winter. In April, 1915, a removable jacket was applied and gymnastic exercises begun. The jacket was continued until well into the summer, when it was omitted, the deformity at this time being so slight that I thought gymnastic exercises would suffice. In the fall of 1915, after several months of such treatment, the deformity was increasing and the child's general condition was bad. The mother, as well as myself, was getting worried. Fig. 1, A, shows the condition. An X-ray was taken a little later, but was taken with the patient lying on her back, and consequently shows a straight spine. If it had been taken in a standing position, the spine would not have been straight. At this stage, a careful history and physical examination revealed the following. The girl did not like to go out and enter into play with children of her age, but would rather remain indoors and play with paper dolls. If she did enter any activity, was quickly "all tired out"—indeed, she complained of being constantly all tired out without doing much of anything. She was a slow thinker, and a slow and halting speaker—in other words, of slow mentality. Complained of stomach-ache and backache, and was inclined towards constipation. Physical examination showed rather a stocky girl, the abdomen, upper arms, and buttocks inclined to be fat. The skin felt thickened, the lower eyelids were swollen and the lower jaw was inclined to hang down. Without any previous experience (this being my first case), it flashed across my mind that here was a case of hypothyroidism with scoliosis. In order to put it to the test, I decided to keep on with gymnastics just the same, and give, in addition, thyroid extract. This was begun October 16, 1915. A remarkable change was almost immediately apparent. Even in a week, the "all tired out" feeling disappeared. The girl began to talk and to initiate the conversation—a thing unknown before. She now thinks, talks, and acts like any child of her age. The spine has now straightened up, as shown in Fig. 1, B.

There are many authors who consider rhachitis as the etiological



**FIG. 1.**

- (a) Upper photographs show the condition in the fall of 1915.  
(b) Lower photographs show the condition in April, 1916, after taking thyroid extract.

factor. Rupperecht, at one extreme, claims that scoliosis without rhachitis is unthinkable. However, the rhachitic process softens the bones and ligaments and undoubtedly is the cause of some of these conditions. Englemann's article is the most elaborate one I have seen and he shows by X-ray pictures the condition of the vertebrae. None of the cases which I have studied seem to show such condition. The fact remains that if present as an etiological factor, we should learn to recognize rhachitis, and then learn how best to treat it physiologically. Such a case usually requires a long time to run its course as treated at present, and this necessitates a long mechanical treatment. If taken in the early stages and the proper physiological treatment instituted, the treatment would be much shorter, and the cosmetic results much more gratifying.

Under infectious diseases may be included the auto-intoxications. Any general infection or intoxication may interfere with calcium metabolism in such a way that the bones become very soft and the ligaments lax. One such case was referred to me in the year 1904. The patient, then aged seven, had recovered from the grippe, and just at this time, it was discovered that the spine had deviated laterally. At this time, gymnastic exercises were given for a long time. It was a striking feature of this case that the bones were extremely soft; they seemed like putty. Things went on, with the deformity increasing rather than being benefited, until finally, all inside of a month or two (this is all memory now), the bone suddenly hardened, the calcium apparently, being deposited very quickly. She still has the scoliotic deformity, regardless of any kind of treatment. With such a case in mind, it is easy for me to believe that any general infection may produce such conditions.

Regarding the toxic conditions, we are now perfectly familiar with the fact that there may be a toxic hip condition which formerly might have passed for a tuberculous hip. Dr. Osgood reported three such cases at the 1914 meeting of the American Medical Association, Orthopedic Section. In the discussion which followed, other cases were mentioned, notably one by Dr. Stern of Cleveland, in which the toxins were definitely traced to veal. It would seem reasonable to consider that the toxins might also affect the spinal column at times. Under such conditions, the abdominal organs would come in for a careful study regarding their physiological processes, and proper treatment should result in a cure.

*Rapid Growth of Adolescence.* During this period of life, it is very common to see deviated spines, and the most important thing to do is to

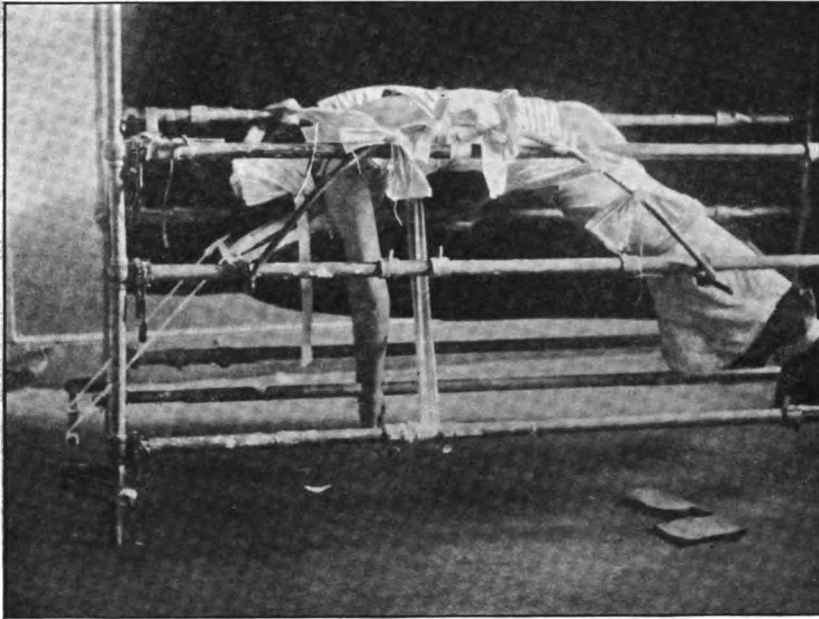
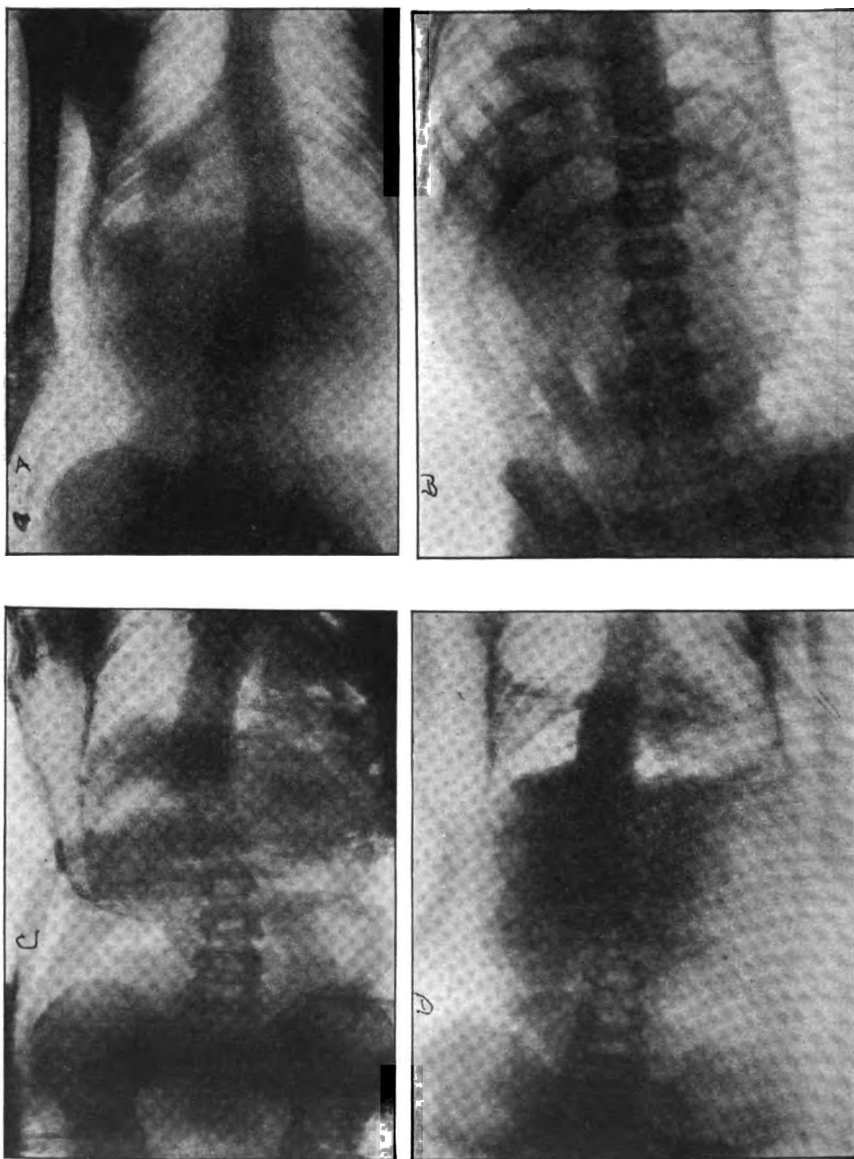


FIG. 2

Showing patient in position, face down, on frame. The body is flexed and traction is being made on head and ankles. Rotary pulls are also in evidence.

get the patient out of doors and to enter into some of the sports which develop the body and stimulate physiological activity. Mechanical treatment in this type is usually not of so much importance. In these cases, the patient is in unstable equilibrium and the spine is easily bent to one side or the other. This was well illustrated by a girl who came to my clinic at the St. Joseph's Hospital. She had grown rapidly, and on measuring this patient, one leg was found to be shorter than its mate, and the spine was deviated laterally on that side. A higher heel was placed on the shoe, and when she next reported, the spine had been pushed over to the other side, showing that the heel was too high. On being lowered, the spine came into the middle position. Here was a spine in such a plastic condition that it could easily be pushed either way. This patient was placed upon thyroid extract, and when she reported, in March, 1916, had been taking it four and one-half months, and although the heels of the shoes had been the same height for three and one-half months (the mother having neglected it), the spine was straight and in the median line. This would seem to show that the





**FIG. 3.**

**A** shows the spine in standing position.  
**B** shows the spine with the patient in position as illustrated in Fig. 2.  
**C** shows the spine in the January jacket.  
**D** shows the spine in the March jacket.

bones and ligaments were now harder and that the spine as an entity was supporting the body weight evenly, without any compensation for the short leg.

*The Mechanical Treatment.* Reference has been made above to the curved position of the body with the face down over a curved frame. When the body is placed back down, the vertebral bodies are pressed more closely together, whereas if the body is placed face down on the curved frame, the body weight in this position tends to separate the vertebrae and thus lengthen the spine as a whole. Incidentally, the spine tends to assume a straight (longitudinally) position. To lengthen the spine still more, traction may be applied to both head and feet. A rotating or twisting pull may also be made in two or three places, as in the Abbott method. By these means, the spine may be made practically straight and then a plaster-of-Paris jacket applied. As stated above, however, when the upright position is assumed, the downward force of the body weight again distorts the spinal column. Instead of cutting windows and padding, I have been interested to see if a frequent change (monthly) of jackets, thus placing the patient in the straight position, for each new application, would accomplish anything in these cases.

I can report only one case in the early stages of treatment.

J. S., now thirteen years old. The mother noticed the curve first in 1912, but it must have been developing for some time before it was discovered. This boy was treated with permanent jackets and then with removable jackets and exercises from 1913 and through 1914. In the fall of 1915, the present studies were begun, and one or two jackets were applied before the mechanics were perfected. It was not until the jacket in January, 1916, that real improvement was demonstrated by the X-ray. In Fig. 3, A shows the spine with the patient standing, B shows the spine with the patient in position as illustrated in Fig. 2. C shows the spine in the January jacket and D in the March jacket. In the May jacket, there is still more improvement, but the picture came in too late to be reproduced here.

In closing, the work described has brought home the fact that the etiology in an early case is of more importance than the mechanical treatment, although the addition of the mechanical treatment is of great assistance in hastening the result. Another point which seems to be forced to the attention is that the early discovery of these conditions should be made, if possible. In the early days of the surgery of the appendix, many abscesses were opened. Perhaps the majority of the cases were held back until the abscess had developed before they were sent into the hospital for operation. Now, the general education of

both the public and the profession has resulted in early diagnoses with operation in the first few hours. Few abscesses have a chance to form. Much is being done just now by a campaign of education of both the public and the profession, to stimulate early action in cancerous conditions. If orthopedic men could also educate both the public and the profession to an early recognition of these scoliotic conditions and the etiologic and mechanical treatment could be instituted in the early stages, many of the severe grades of deformity now seen would disappear. It is self-evident that this work can be considered only preliminary, but the results in the reported cases and in others have been so encouraging that I felt it warranted publicity.

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### REPORT OF A CASE OF SPINAL CORD TUMOR.

BY W. W. PLUMMER, M.D., BUFFALO, N. Y.

THE following case of tumor of the spinal cord is brought to your attention because of two or three features which seemed to the writer to be unusual and of sufficient interest to warrant a brief report. The history and type of the paralysis and the X-ray findings, in the light of what was demonstrated at the time of operation, are all worthy of note.

*History.* In July, 1914, a sixteen-year-old Brazilian boy first noted a persistent high dorsal backache, which became continuous, and lasted until July, 1915, when his disability began. His previous medical history and that of his family are of no interest. In July, 1915, he began to have pain in both legs, and noted some loss of power. These symptoms increased, until in October, 1915, he was unable to walk. His own description of his condition at this time, October, drew the picture of an increasing spastic paralysis of both lower extremities, with constant pain in the legs and a tendency to convulsive movements in the same region. His symptoms increased rapidly and he was brought to the General Hospital December 7, 1915.

The net result of his examination there showed a fairly well nourished and muscled boy, with a marked deformity in the upper spine, and a spastic paralysis of both lower extremities. There was no atrophy, but beginning trophic changes in the skin, all reflexes, including Babinski, markedly exaggerated. Sensation lost to the level of the third rib. Bowels moved by lavage, urine under fair control. A constant and severe pain referred to both lower legs. No tender points. Any attempt to move or

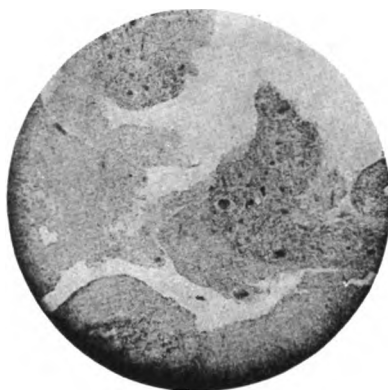


FIG. 1.

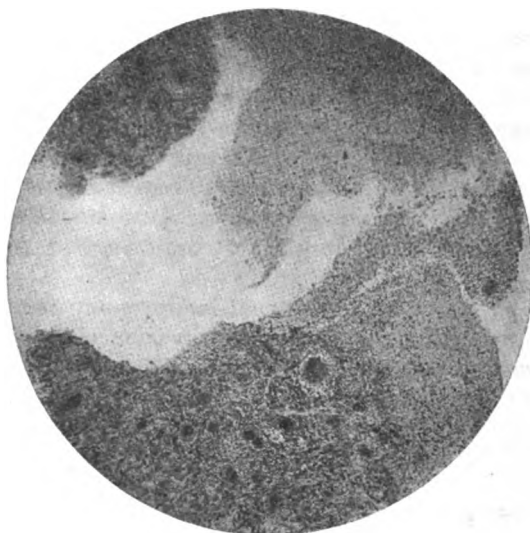
Radiograph of upper dorsal spine. Bone destruction demonstrated at operation not shown in X-ray.

turn patient was likely to result in a series of incoördinate and violent movements of both legs. No fixed posture assumed. The upper extremities and breathing normal. Pulse and temperature normal. The laboratory findings, including Wassermann reaction, and X-ray threw no light on the case. The deformity of the upper spine, when closely examined, proved not to be a kyphos, which it seemed to be at first glance, but rather an enlargement of or over the back of the spine. This was not tender and did not fluctuate. The clinical diagnosis at this time lay between tumor of the cord and gumma. Because of the rapid progress of pressure signs, decompression of the cord was assumed to be indicated. The first, second and third dorsal vertebrae marked the level to be opened.

*Operation.* December 12. The usual laminectomy for decompression was planned and begun. In making the incision along the tips of the spinous processes the dissection was begun on the tip of the second. As the knife cut through the ligamentous structures, it did not reach bone, but suddenly entered a cavity, from which gushed an ounce or more of dark grumous fluid like that found in a hematoma. A similar incision over the third tip produced the same result. There then began considerable free bleeding from inside the cavity. Continuing the dissection, the first and fourth processes were found intact, but the laminae and spinous processes of the second and third were uniformly eroded to



**FIG. 2.**  
**Low power section of tumor.**



**FIG. 3.**  
**Higher power section of tumor.**

tissue paper thinness. When the field was cleared, an oblong cavity was presented, lined with a glistening membrane which might have been dura or periosteum, and from which bulged a dark cyanotic and friable tumor mass, which bled freely with the least touch. Removal of laminae and process of the first vertebra showed a thickened spinal cord. The cord could not be traced through the tumor or below. As decompression only was sought at this time, tissue for section was removed and the wound closed without drain. Uneventful healing and recovery followed, with decided relief from pain. No change in paralysis, convulsive movements of legs less frequent and less violent.

*Pathologist's Report.* A tumor mass, including bone and connective tissue, highly vascular, and showing all the histological characteristics of giant cell sarcoma. No nerve tissue found in the specimen presented.

*Second Operation.* Because of the improvement in part at least of his condition, it was deemed wise to attempt a second operation with the possibility of removal of the tumor in mind. This second operation was done on January 29, 1916. Incision in the field of the first operation revealed conditions as before, except that the tumor was less congested and could be lifted slightly from its sack. It was then found that the tumor extended out into the root foramina. It was not possible to trace the cord after it entered the tumor mass. For this reason and because of the extension along the roots the case was deemed inoperable, and the wound closed as before. Again, an uneventful healing and recovery. There has been no change of note in the condition of the patient up to a recent date, and no signs of metastasis.

The case presents at least these two interesting features. In the first place this tumor, as found at operation, should have produced the equivalent of a complete section of the cord at the level of the second dorsal vertebra. That it did not is evidenced by the type of paralysis, yet there was no sufficient amount of cord tissue to be observed in gross, or to show in the sections removed from several planes of the tumor. The X-rays, which were good stereograms, gave no definite hint of the enormous bone destruction, although we examined them carefully before and after operating, and it was only in the second examination that we thought we could make out slight changes in bone density. These facts are somewhat discouraging, as they greatly diminish the likelihood of a correct early diagnosis in a similar case. In the present instance a cord tumor had not been considered until he came into the hospital, and that, of course, only after the cord symptoms were well developed. Appreciating the characteristics of the giant cell sarcoma, it is quite possible that this boy might have been saved by operation, could a diagnosis have been established during the first stages of his disease.

## Editorial

WITH the publication of this issue the AMERICAN JOURNAL OF ORTHOPEDIC SURGERY completes its first year as a monthly publication. Any change that is made is always a matter of experiment and it is at such periods as this that we must look back and examine our results.

A year ago it was confidently felt that there was a demand for a change, and that the field for orthopedics had increased to such an extent that it was worthy of better representation in medical journalism. We feel today that we were fully justified in our expectations, as is shown by the material growth that has been accomplished with the change from the quarterly to the monthly publication.

The list of subscribers has shown an increase of about 200% since the change was made. This, of course, is very encouraging, but what is of more importance is to discover what group of men have taken the JOURNAL. The interest now is not confined to the rather small group of strictly orthopedic specialists, but evidently has been extended to those who are engaged in general surgery or medicine.

There was a general feeling that this JOURNAL represented the work of the American Orthopedic Association only, and that its pages were not open to other contributions. The fact that it was published as a quarterly rather strengthened this idea. Although the work of the Association is recorded in this JOURNAL and the JOURNAL is the official publication of the Association, yet a considerable portion of the pages are devoted to papers which have not been presented to that body. We intend to make the JOURNAL representative of a larger group, and we have already accomplished this to a large extent.

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## Correspondence

SAN FRANCISCO, CALIF., November 15, 1916.

*Editor American Journal of Orthopedic Surgery:*

Dear Sir—The excellent article by Dr. Allison on experimental tuberculosis in the current number of your JOURNAL suggests two points to which I should like to call attention: First, the theory of tuberculosis and red marrow cannot be tested out on laboratory animals, for they have red marrow in their shafts as well as in the extremities of long bones. Second, conclusions must be drawn with great caution from experimentally produced tuberculosis in animals. Clinically, as is well known, tuberculosis occurs with great frequency in certain tissues, less often in others, and never in others. Thus muscle tissue and fat are practically immune, fibrous tissue also, but probably tuberculosis can be produced *experimentally* in any soft tissue. If a macroscopic bit of a pure culture of tubercle bacilli, be introduced on a wire loop into a cut in an animal's muscle, it will grow every time. In a recent series of experiments, soon to be published, Dr. Cowan and I have tried this out.

Yours very truly, LEONARD W. ELY.

# American Orthopedic Association

## THIRD REPORT OF THE COMMITTEE ON THE TREATMENT OF STRUCTURAL SCLIOSIS.

At the meeting of the American Orthopedic Association in June, 1915, your Committee on the treatment of Structural Scoliosis was continued, at the request of Dr. Abbott, in order that a further report might be made upon the cases submitted by him at that time and in which the treatment had been interrupted, owing to unfortunate circumstances.

Of the four original cases submitted to the Committee for examination in October, 1914, two were offered for re-examination by the full Committee, at Washington, in May, 1916; both of them were of grade C. No. A3, a case of so-called idiopathic structural scoliosis, and the other, No. A4, a case following poliomyelitis. The photographic and roentgenological records were made by Drs. Osgood and Brown, at Portland, Maine, in April, 1916, employing the methods already described by the Committee. At the request of Dr. Abbott, roentgenographic records were also made of the patients in their celluloid jackets and in the frame, the force being applied in the latter as for a plaster jacket. These records are hereby submitted to you, and you have had the opportunity of examining these cases yourselves, through the kindness of Dr. Abbott who brought the patients to Washington.

A study of these records seems to show:

1. That a correction of the lateral deformity has been maintained without the retentive jacket, and that an over-correction of the lateral deformity may be obtained while the patient is lying in the frame with corrective straps in place.
2. That improvement in the rotation of the vertebrae themselves has taken place in all positions of examination, but that complete correction of the rotation has been accomplished in none.
3. That a marked over-correction of the rib deformity has taken place, which over-correction is out of all proportion to the actual changes in the position of the vertebrae. In this connection your Committee wishes to emphasize the impossibility of estimating change in the spinal deformity by changes in the rib contour.

It seems to the Committee that Dr. Abbott has obtained in these two cases a fair degree of over-correction of the lateral deformity of the spine, accompanied by some diminution of the amount of rotation of the vertebrae themselves and associated with an extreme reversal of the rib deformity. However, in the opinion of the Committee, these changes have been brought about by the use of a degree of force which must have approached the point of danger.

They believe also that postural changes as extreme as those shown in these cases may well constitute a serious menace to the general health of patients, but they recognize that this degree of improvement in the essential deformity is at present greater than that which the Committee have so far observed to have taken place by the use of any other method.

They regret that only two cases in which it has been possible for them to examine the patient both before and during treatment have been submitted by Dr. Abbott.

(Signed)

ALBERT H. FREIBERG,  
DAVID SILVER,  
ROBERT B. OSGOOD.



# New Apparatus

## A RUSTLESS AND STAINLESS STEEL FOR ORTHOPEDIC APPARATUS.

BY ROLAND MEISENBACH, M.D., BUFFALO, N. Y.

IN presenting to the Association this new rustless and stainless steel for orthopedic apparatus and for surgical instruments, it might be said that it has many advantages over the ordinary steel generally used for these purposes. It does not require to be nickel-plated and gives a very excellent and durable finish after being burnished. In the case of flat-foot plates, it can be tempered to the proper elasticity and will give the flexibility that is desirable. At the same time, it seems quite tough and does not corrode or rust when subject to moisture. This is again a great advantage in flat-foot plates. For surgical instruments, the fact that it does not have to be plated and will stand a solution of bichloride of mercury and others, without tarnishing, is also of obvious value.

I have tested this steel nine months, having placed burnished pieces into solutions of sal ammoniac and bichloride of mercury, and allowed them to remain for many hours without any noticeable difference upon the steel. Of the specimens which I present to you, gentlemen, one, a varus brace, my man had buried in moist soil for three months. The osteotome which I present has been used over six months, and you will note that its finish is almost that of nickel.

The steel is known as "Stainless Steel." For the working and properties of the steel, I might best quote from a letter which I received from the company, which is as follows:

*"Dear Sir:* This 'Stainless Steel' was brought out primarily for table cutlery. It is a steel which can be hardened—not file hard, but to the proper hardness for table cutlery. The steel in its hardened condition has a sclerescope hardness of about 70 to 80—a file will just take hold of it. 'Stainless' will be used for a great many purposes besides cutlery, but it is not our intention to recommend it for any particular purposes. We prefer to supply samples and allow the users to decide for themselves if they can use it to advantage. It is not a cheap steel—the price being 35 cents base per pound, and naturally it will be used only in places where this price is warranted. This price is subject to the usual tool steel extras and one cent per pound for annealing. It can be rolled into ordinary sizes of bars and it can also be supplied in strips, if not too wide or too thin. This grade is not carried in our warehouse stocks, but each lot is made to order at our mill.

"In regard to the heat treatment of 'Stainless,' there are four features to be considered, viz:

#### FORGING.

"When 'Stainless Steel' is forged, it must be heated to a good forging heat and must not be allowed to cool down during the forging operation below a temperature of 1650° F. The steel must be forged at a bright red. If the work is put on the steel after it drops below this heat, it is liable to crack or break under the hammer. One of the characteristics of the steel is that if heated to a temperature of 1650° F. and allowed to cool quickly it becomes hardened, consequently after forging it must be annealed before it can be machined.

#### ANNEALING.

"The annealing of 'Stainless Steel' should be done exactly the same as any high-grade tool steel, excepting that the heat should be about 1400° F. The best way is to put the steel in pipes and cool pipe and steel very slowly in a pit. A satisfactory way, however, for most purposes would be to heat to about 1400° F., in an open furnace, then close up the furnace and allow the steel to remain in the furnace while the temperature drops slowly to 1100° F., then take the steel out and allow it to cool naturally in the air.

#### HARDENING.

"To harden 'Stainless Steel,' heat slowly and uniformly to a temperature from 1700° to 1800° F., and quench in oil or water or cool in an air blast. The heat at which the steel is quenched seems to have a very large bearing on the hardness, thus: A piece if heated to 1600° F. and quenched in oil showed a tensile strength of 150,000 pounds—elastic limit of 93,000 pounds with 9% elongation and 20% reduction of area and a sclerescence hardness of 57 points. The same piece of steel heated to 1800° F. and quenched in water was intensely hard and after drawing to 1000° F., it had a tensile strength of 197,000 pounds—elastic limit of 136,000 pounds—1% elongation, and 2% reduction of area. The sclerescence test showed only 58 points hard, but the steel was practically 'dead hard.'

#### DRAWING THE TEMPER.

"The temper of 'Stainless Steel' should be drawn after hardening, varying the amount of drawing to suit the purpose, but in all cases running higher than one would draw water-hardening tool steel for the same purpose."

# Orthopedic Society Meetings

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## EASTERN STATES ORTHOPEDIC CLUB.

On Thursday, November 16, there was a meeting held at the Hartford General Hospital, Hartford, Conn., at the clinic of Dr. Paul Swett. There was shown a large number of cases which represented the end-results of various orthopedic operations. There were several cases presented which showed the results of operations for deformities following infantile paralysis. Dr. Swett presented two cases of loose fracture of the hip in which a nail had been used to secure apposition. He said that his results had been good and the cases which were exhibited showed very good function and position. Several cases of joint fracture were shown.

Dr. Ansel G. Cook entertained the Club at his office and demonstrated various forms of orthopedic apparatus.

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## THE NEW YORK ACADEMY OF MEDICINE.

### SECTION ON ORTHOPEDIC SURGERY, FRIDAY, NOVEMBER 17, 1916.

#### CLINICAL MEETING.

1. A Case Showing Inability to Flex the Hip without Marked Eversion and Abduction. Reginald H. Sayre, M.D.
2. A Case of Marked Bow Legs from Epiphyseal Destruction; Operation. T. Halstead Myers, M.D.
3. A Case of Cervical Ribs. Charles Jaeger, M.D.
4. (a) An Unusual Case of Osteomyelitis of a Finger.  
(b) A Case Demonstrating the Use of Tuberculin as a Diagnostic Therapeutic Measure in a Tuberculous Ankle.
- (c) A Case Demonstrating Absence of Reaction in a Non-Tuberculous Ankle. Samuel Kleinberg, M.D.
5. A Case of Congenital Malformation of the Vertebrae. William Frieder, M.D.

INTERURBAN ORTHOPEDIC CLUB.

JOHNS HOPKINS HOSPITAL, BALTIMORE, MD.

FRIDAY MORNING, NOVEMBER 24, 1916.

Operation, Arthroplasty of the Hip. Dr. Wm. S. Baer.  
 The Treatment of Haemophilia. Prof. Wm. H. Howell.  
 Intramedullary Bone Grafts. Dr. Walter E. Dandy.  
 Tumors of the Spine and Spinal Cord. Dr. George J. Heuer.  
 Intraspinal Injections of Salvarsan. Dr. Charles M. Byrnes.  
 The Tonsil in Relation to Various Forms of Arthritis. Dr. Samuel Crowe.  
 Statistics Bearing on the Amount of Venereal Disease in Baltimore. Dr. George Walker.  
 Exhibition of Mechanical Apparatus and Surgical Instruments. Dr. George E. Bennett.  
 Radiographic Demonstration of Various Lung Conditions. Dr. F. H. Baetjer.  
 Surgical Clinic. Prof. William S. Halsted.

FRIDAY AFTERNOON, NOVEMBER 24, 1916.

The Organization of a Surgical Unit. Dr. Hugh H. Young.  
 Drainage of Seminal Vesicles and Prostate in Arthritis. Dr. Hugh H. Young.  
 The Test of Kidney Function for Surgical Interference. Dr. T. Gehroty.  
 Thorium—a New Agent in Pyelography. Dr. J. Edward Burns.  
 Use of Kethalin as a Haemostatic. Dr. Cecil.  
 Benign Tumors of the Tendon Sheath. Dr. Montgomery R. Reid.  
 Pulmono-Osteoarthropathy. Dr. Bayne Jones.  
 The Mechanical Laws Underlying the Structure of the Femur. Mr. J. C. Koch.  
 The Results of Membrane Arthroplasty. Dr. Wm. S. Baer.  
 Rhachitic Changes of the Thorax. Dr. Edward A. Pork.  
 A Comparison of the Permanence of Free Transplants of Bone and Cartilage. Dr. John Staeger Davis.

SATURDAY MORNING, NOVEMBER 25, 1916.

Operative Clinic. Dr. J. M. T. Finney.  
 The Clinical Aspects of Epidemic Anterior Poliomyelitis. Dr. Rosenthal.  
 The Colloidal Gold Reaction of the Cerebrospinal Fluid in Acute Anterior Poliomyelitis. Dr. Maxie and Dr. Felton.  
 The Pathological Findings in Anterior Poliomyelitis. Dr. Montrose Burrows.  
 Rhachitic Changes of the Thorax. Dr. Edward A. Pork.  
 Orthopedics—En Casserole. Dr. Rhodes Fayerweather, Dr. George E. Bennett, Dr. Allen G. Krause, Dr. D. F. Elmendorf, Dr. Louis Coss Spencer, Dr. Wm. S. Baer, Dr. Lawrence K. McCafferty.

SATURDAY AFTERNOON, NOVEMBER 25, 1916.

Orthopedic Clinic. Dr. R. Tunstall Taylor.

# Current Orthopedic Literature

- I. Tuberculosis of Bones, Joints and Tendons.
- II. Paralytic Diseases and Their Deformities, Nerve Lesions with Arthropathies.
- III. Non-Tuberculous Bone and Joint Diseases.
- IV. Metabolic Disturbances Causing Bone and Joint Disease.
- V. Scoliosis and Static Disturbances.
- VI. Bone and Joint Tumor. Neoplasms, Benign and Malignant.
- VII. Congenital Defects, including Congenital Dislocations.
- VIII. Traumatic Lesions, Fractures and Dislocations.
- IX. Miscellaneous Diseases, General Orthopedic Articles, Physical Therapy, Apparatus, etc.
- X. War Surgery.

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## I. TUBERCULOSIS OF BONES, JOINTS AND TENDONS.

JEAN-PIERRE DAVID: THE MAN WHO POTTED POTT. John Ridlon. *Boston Med. and Surg. Jour.*, Sept. 7, 1916.

Dr. Ridlon calls attention to the common misbelief that Pott first described "Pott's disease," and after quoting from the articles of Pott and Jean-Pierre David describing this condition (the latter writing a year before Pott wrote) makes this characteristic comment: "Placed side by side with Jean-Pierre David, the real man, Percival Pott, with his setons and issues, his kidney-beans and finely powdered cantharides, bulks very small, and a very pathetic figure."—*R. Wallace Billington, Nashville.*

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SIMPLE APPARATUS FOR TREATMENT OF INCIPIENT HIP JOINT DISEASE. G. G. Speer. *American Journal of Surgery*, September, 1916.

An article hard to abstract because it calls for criticism and is not clear in places. The author maintains that in the "incipient" stage of hip disease, the treatment resolves itself into two phases: first, extension to separate the joint surfaces; and, second, to reduce the joint to a state of immobility and, in cases where the disease is far advanced, to produce permanent complete immobility of the joint.

The apparatus as described below, the author thinks, has never been described. For night wear is used a split plaster boot with a wire loop, to which weights are attached. For day use, an extension sole on the shoe of the well leg; a lead weight, as heavy as patient can carry comfortably, in place of a heel used on diseased side. A pair of crutches for ambulatory treatment. He states that apparatus between ankle and shoulder, to maintain immobilization, is unnecessary, because the "extension" maintains the correct line from the shoulder through the leg. By the term "extension" he presumably means traction.

He reports two cases, one an old chronic case, and the second an "incipient" one, following dislocation of the hip, in which the "X-ray showed a wasting away of part of the head of the femur." The relief in these cases was symptomatic, and no consideration of the future of these hips seems to have been given.—*C. L. Lowman, Los Angeles.*

## II. PARALYTIC DISEASES AND THEIR DEFORMITIES. NERVE LESIONS WITH ARTHROPATHIES.

**NERVE GRAFTING.** Enderlen and Knauer. *Münch. med. Woch.*, Dec. 7, 1915, lxi, No. 49.

In a case of defect of the ulnar nerve, the authors grafted the upper and lower ends into the median. Although this was apparently successful in a dog, it failed in man.—*George I. Bauman, Cleveland.*

**DEVICE TO OVERCOME RADIAL PARALYSIS.** M. Goullious. *Lyon Chirurgial*, May-June, 1916, xiii, No. 3, p. 515.

The author suggests the following apparatus: A broad, laced leather cuff surrounding the lower half of the forearm, on each side steel strips jointed at the wrist, with spring to extend the hand. From the wrist joint run two steel bars, one on the ulnar side of the hand, and the other passing behind the thumb and attached to an incomplete ring of steel holding the hand below the bases of the fingers. To the dorsal side of this ring are attached small wires of spring steel, one on each side of each finger. These hold a soft band passing under the joint of the middle and proximal phalanx, thus keeping a proximal portion of the finger extended and allowing some flexion. The same type of spring is applied to the thumb.—*DeForest P. Willard, Philadelphia.*

**SUPPORT FOR PERONEUS PARALYSIS.** Nieny. *Münch. med. Woch.*, Jan. 11, 1916, lxiii, No. 2.

Apparatus consists in a posterior bent wire trough, extending from the calf to the toes, holding the foot at right angles. A second apparatus consists simply in a leather cuff above the ankle, to which is attached in front a semicircular spring. At the end of this another spring is attached, which goes to the anterior part of the foot and holds it at a right angle.—*George I. Bauman, Cleveland.*

**APPLIANCES IN PARALYSIS OF THE RADIAL AND EXTERNAL POPLITEAL NERVES.**

J. Privat and J. Belot. *Presse Médicale*, Aug. 7, 1916, xxiv, No. 44.

1. In radial paralysis the aim is to keep the nerve and the muscles supplied by it, in a relaxed condition.

2. To ensure extension of the fingers and wrist, and at the same time permit the movement of flexion.

3. When the flexors of the fingers contract, maintain extension of the wrist to permit of a firm grasp. The apparatus consists of a steel spring and a leather band provided with hooks (see figure, as the only way to get the idea) to extend the fingers; a ring of leather joined to minor ring of steel frame by a caoutchouc, goes over the thumb to insure extension and abduction of that member. The cross bar of the apparatus rests back of the heads of the metacarpal bones or at the junction of the metacarpo-phalangeal articulation, according to the use to which the hand is to be put. A study of the act of grasping shows that the fingers can best grasp an object when the hand is in a position of hyperextension 30-40°. That position in health is produced by muscles supplied by the radial nerve. The more the flexors contract the more the extensors are brought in action. Flexion and extension of the wrist is difficult to bring about when the fingers grasp firmly an object held in the hand. For light work (writing, for instance) the apparatus is constructed of light wire, 2 mm.; for heavy work, from 2 mm. to 3½ mm.

4. To have the instrument constructed at a distance, the measurements required are the width in centimeters of the hand at the roots of the fingers, and the distance between the two styloid processes at the wrist.

In paralysis of the external popliteal nerve, the aim of the apparatus is:

1. To place the nerve and the muscles supplied by it in a relaxed condition.

2. To permit of the movement of the tibio-tarsal articulation.

3. To render the walk correct while the foot is in a state of oscillation, so that it may not hitch into the floor, and so that the heel comes down first at the moment of support. The instrument consists of a steel spring placed in front of the heel of the shoe; to this an upright bar is attached, running up on each side of the leg, and is fastened around the calf by a leather collar. If the calf is wounded, the bars are regulated in their length, to avoid pressure on the wound. My impression is that without the illustration little good can come from this article.—*Daniel LaFerté, Detroit.*

**FAMILY SPASTIC PARALYSIS: REPORT OF FOUR CASES.** J. H. W. Rhein. *Jour. of Nervous and Mental Disease*, August and September, 1916.

The author reports four cases of spastic paralysis in one family, all occurring in children before eight years of age, and illustrating variations of the condition in the same family, as observed by Strümpell.

Symptoms were rigidity of legs and spasticity, exaggerated reflexes; later, mental deterioration. These varied in degree with other changes in the different ones. He gives a very thorough résumé of the cases in literature, with comments on the cases. Nothing of special orthopedic note.—*C. L. Lowman, Los Angeles.*

**THE RAT AND INFANTILE PARALYSIS: A THEORY.** Mark W. Richardson. *Boston Med. and Surg. Jour.*, Sept. 21, 1916.

The author does not believe that poliomyelitis is transferred from person to person by direct or indirect contact, but that in some manner, insects play an important rôle in the epidemiology of this disease. He presents thirteen facts arguing against transfer by human contact and nine supporting his theory of transfer by rodents, insects, or both. They cannot be briefly stated in an abstract. He believes that the contact theory cannot reasonably be made to fit these facts. He admits that the validity of the rodent theory must be proven by further experimental evidence.—*R. Wallace Billington, Nashville.*

**RECURRENT POLIOMYELITIS: SECOND ATTACK AFTER A PERIOD OF THREE YEARS.** E. W. Taylor. *Jour. of Nervous and Mental Disease*, September, 1916.

Despite the dogmatic statement recently made by Dr. Simon Flexner, that "Infantile paralysis is one of the infectious diseases in which insusceptibility is conferred by one attack," Taylor reports a very convincing case to the contrary, in which there was a recurrence of poliomyelitis after a lapse of three years from the first infection. Each of the attacks was accompanied by separate and distinct flaccid, atrophic paralysis in different regions of the body. He also gives a survey of the published cases which he was able to collect in the literature; one group reported by Auerbach, Neurath, Lövegren, Sinkler, Friedjung and Hennelly, in which the so-called second attack occurred in no instance more than four months after the first. So short an interval of time between attacks is hardly sufficient upon which to base a theory of an actual second attack, but looks more like an exacerbation or a relapse of the original infection. However, it is worthy of note that such

relapses should occur, and it certainly cannot be definitely stated that even these cases are not reinfections.

Other cases in which longer intervals supervened between attacks are reported by Sheppard, 16 years; Esharer, 11 years (doubtful case); Echert, 6 years; Lucas and Osgood, 2 years 3 months; Oulmont and Bondouin, 1 year (doubtful case); Sanz, 14 years.

Undoubtedly, poliomyelitis, in the great majority of cases, confers a lasting immunity. It is also definitely established that exacerbations or relapses may occur at short intervals of time after the primary onset, and it is rational to believe that the first attack in rare cases does not lead to such an immunity, but that a second and entirely independent attack is possible.—*R. B. Cofield, Cincinnati.*

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#### THE PARALYSIS OF POLIOMYELITIS: ITS TREATMENT IN THE EARLY STAGES.

H. B. Thomas. *Jour. Amer. Med. Assn.*, Sept. 23, 1916, p. 949.

This brief article lays timely emphasis upon the necessity of avoiding strain and fatigue of the paralyzed or partially paralyzed muscles during the early stages of recovery. This is particularly apt to occur in the mild type, in which no gross paralysis exists, and in which weakened muscles are frequently overlooked. Here we should look for any evidence of weakness or tendency to malposition when sitting or lying, or after exercise. Likewise massage, passive and active motions, must be diminished if there is less power following their use, it being much safer to underdo than overdo in this stage of the treatment.—*Eben W. Fiske, Pittsburgh.*

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### III. NON-TUBERCULOUS BONE AND JOINT DISEASES.

IDIOPATHIC INFANTILE OSTEOPSYTHYROSIS. Edward S. Blaine. *Amer. Jour. of Roentgenology*, September, 1916, iii, p. 438.

The author reports a typical case, with careful Roentgen study. The long bones show a thinned-out cortex, barely distinguishable from the medulla. The diameter of the shafts is lessened, but the length is normal. At the site of fracture there is a local absorption of the bony tissue of the fragment ends. This absorption area includes the entire width of the bone, and has been called the "absorption ring." The apparent healing of the fractures is due to the hypertrophy of the periosteal portion of the callus, the cortex lacking calcium salts. Etiology is discussed, but nothing definite is made out except that it is thought to be due to a deficiency in one of the internal secretions. Treatment is similar to that of rickets, but usually ineffectual.—*Roland Hammond, Providence.*

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CONGENITAL ANOMALIES AND VARIATIONS OF THE BONY SKELETON AS REVEALED BY THE X-RAY. Adolph Hartung. *Amer. Jour. of Roentgenology*, September, 1916, iii, p. 430.

The author points out numerous anomalies and variations in the bony skeleton which need to be kept constantly in mind in order that some pathological condition may not be diagnosed. The changes considered are divided into three classes: (1) congenital anomalies, such as fetal monstrosities; (2) obvious deformities in which the X-ray gives accurate information of the bony elements involved, such as club-foot, club-hand, scoliosis associated with asymmetrical development of the vertebrae, torticollis associated with cervical rib, spina bifida, and congenital dislocation of the hip; (3) anomalies which may give rise to no symptoms, but which are important if



errors in Roentgen diagnosis are to be avoided. In this latter class are included variations in the sutures, sinuses and sella in the skull, variations in the number as well as the character of the vertebrae, anomalous development or fusion of the ribs, fissure of the sternum, absence of the distal end of the clavicle, persistence of the acromial and coracoid processes of the scapula as separate bones, and the variations in the supernumerary carpal and tarsal bones, as well as the occasional fusion of these bones. The carpal and tarsal bones at times show areas of increased densities, the so-called "compact islands," which are without pathologic import. The patella may be bipartite, and other anomalous sesamoid bones may cause confusion in diagnosis. The article is a very helpful one, and the numerous illustrations are excellent.—*Roland Hammond, Providence.*

**RELATION OF SEPTIC MOUTH TO ARTHRITIS.** F. L. Morey. *United States Naval Medical Bulletin*, October, 1916.

Morey believes that the septic mouth is the cause of a large majority of cases of acute and chronic arthritis, and that it is the focus of infection from which many cases of nephritis, cardio-vascular disease and ulcers of the gastro-intestinal tract begin. All of these conditions are more or less relieved by placing the mouth in a hygienic condition, which consists in removing all badly decayed and broken-down roots, and treating the root canals of those that can be treated if it is possible to reach the apex of each canal. If this is not possible, the tooth had best be removed. All cases of pyorrhea should be treated, obliterating as far as possible all pockets where food may lodge and set up an irritation. The article has appended some interesting case histories.—*R. B. Cofield, Cincinnati.*

**ACUTE SEPTIC ARTHRITIS OF THE SACRO-ILIAC JOINT.** J. K. Young. *Urologic and Cutaneous Review*, September, 1916.

An interesting report of a case of gonococcus infection in the left sacro-iliac. Acute onset, septic temperature, leucocyte count 14,600, pain in left hip, heat, swelling, retracted abdomen, delirium.

Immediate operation and drainage. No pus obtained by aspiration. Later decided to open up the joint freely; found denuded periosteum and brownish pus. Fifth day after admission and after the joint operation an epididymitis ensued.

Author urges early recognition, and immediate operation and drainage, even though pus is not in evidence at the time.—*C. L. Lowman, Los Angeles.*

**V. SCOLIOSIS AND STATIC DISTURBANCES.**

**FLAT-FOOT AND ITS MEASUREMENTS.** M. Clements. *United States Naval Medical Bulletin*, October, 1916.

The "Feiss-line" is a line drawn from the lower border of the internal malleolus to the lower tubercle on the head of the first metatarsal bone. A distance not to exceed one-half inch has been stated as the normal distance of the scaphoid tubercle below the Feiss-line. While the anterior end of this line varies in height above the floor within very narrow limits, its posterior end varies within wide limits, due to the difference in height above the floor of the internal malleoli in different individuals. The author therefore concludes that the Feiss-line is a *movable* line, and hence it is fallacious to adopt it as a standard for measuring the height of the inner arch of the foot. The true height of the arch is more accurately determined by the perpen-

dicular distance from the floor to the scaphoid tubercle. Observations made from the study of 190 feet would indicate that no foot in which the scaphoid tubercle measured one and one-half inches or more above the floor had any signs of flat-foot. With one exception, every foot in which this measurement was less than one and one-fourth inches had one or more signs of flat-foot. Thus three fairly definite groups exist: Good feet, 1 1/2 in. and over; poor feet, less than 1 1/4 in.; and a middle group, ranging from 1 1/4 in. to 1 7/16 in., which includes both good and poor feet, in which the diagnosis must rest upon a consideration of the several signs of flat-foot.—*R. B. Cofield, Cincinnati.*

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REPORT OF TWO CASES OF SCOLIOSIS, ACCOMPANIED BY PRESSURE PARALYSIS OF THE LOWER LIMBS. John Ridlon. *Jour. Amer. Med. Assn.*, Sept. 9, 1916, p. 803.

Ridlon reports two cases of motor spastic paralysis, similar to that seen in tuberculous spondylitis, associated with and apparently depending on scoliosis. One, carefully nursed, and kept on a gas-pipe frame, recovered in four months, while the other, not so carefully nursed, had gained voluntary control of the movements of the limbs at the end of six months, but the tendon reflexes remained exaggerated.—*Eben W. Fiske, Pittsburgh.*

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## VI. BONE AND JOINT TUMOR. NEOPLASMS, BENIGN AND MALIGNANT.

AVIATORS' OSTEOMA AT THE BACK OF THE NECK FROM FALL. Vorbe and L. Rocher. *Jour. de médecine de Bordeaux*, July, 1916, lxxxvii, No. 9.

The author presents a case history of an aviator who developed a tumor on the spinous processes of the 4th and 5th cervical vertebrae. It was first noticed following a fall from an aeroplane four and a half years previously. The tumor was hard, smooth and firmly attached to the spinous and transverse processes of the 4th and 5th cervical vertebrae. On removal it was found to be an osteoma. Author believes that the formation was due to the proliferation of bone following the tearing of the periosteum, due to over-stretched cervical ligaments.—*DeForest P. Willard, Philadelphia.*

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## VII. CONGENITAL DEFECTS, INCLUDING CONGENITAL DISLOCATIONS.

CONGENITAL CLUB-FOOT. G. I. Bauman. *Cleveland Medical Journal*, April, 1916.

The article is intended as a guide to general practitioners in the treatment of club-foot, rather than an attempt to advance anything new. The author's chief points are as follows:

Treatment should be instituted as early as possible, but nothing should be done during the first eight to ten months which will interfere with the baby's nutrition or the development of the foot and leg.

Open operations are rarely advisable in the infantile cases, and should be avoided as much as possible in every case.

Treatment should be persisted in, and the child should walk upon the over-corrected foot a sufficient length of time to establish thoroughly the proper position.—*G. I. Bauman, Cleveland.*

## VIII. TRAUMATIC LESIONS, FRACTURES AND DISLOCATIONS.

FRACTURES ABOUT THE WRIST IN CHILDHOOD AND ADOLESCENCE. A. C. Burnham. *Annals of Surgery*, September, 1916.

Fifteen cases of fractures about the wrist joint, which occurred before ossification of the lower radial epiphysis, form the basis of study in this paper. The patients ranged in age from three to twenty years. The most common fracture met with before the tenth or twelfth year is a fracture of both radius and ulna, either green-stick or complete. The X-ray is not always reliable in showing this type of fracture, therefore the diagnosis has to be made from local symptoms, such as the localized point of tenderness, etc.

Typical Colles' fracture is very uncommon before early adult life. Separation of the lower radial epiphysis is of most frequent occurrence during the twelfth, thirteenth and fourteenth years. Before the eighth or ninth year the epiphysis is mostly cartilage, and consequently firm and resisting, and is so small as to escape any evulsive force, while in later years (from sixteen onward) the line of cartilage is very thin, and so firm that the bone is often broken rather than separation taking place.

Fracture of the radius in childhood or adolescence usually occurs at a point considerably higher than is the case when the injury occurs later in life.—R. B. Cofield, *Cincinnati*.

A PLEA FOR CONSERVATISM IN THE TREATMENT OF CLOSED FRACTURES FROM A ROENTGENOLOGIC STANDPOINT. Samuel B. Childs. *Amer. Jour. of Roentgenology*, August, 1916, iii, p. 390.

The author sounds a note of timely warning against the wave of operative frenzy which has swept over the country during the past few years. He cites numerous cases in which good functional results were obtained, after repeated efforts to improve a poor anatomical position had failed. From the cases illustrated in the article, showing fractures left unreduced, we feel that such conservatism would not usually be justified, and that Nature has been kind in these particular cases. In our experience, these unreduced fractures would just as often result in crippled, painful joints. We believe that better anatomical results can usually be obtained by conservative methods, without resorting to open operations.—Roland Hammond, *Providence*.

CONTRIBUTION TO THE PATHOLOGY OF THE SCHLATTER-OSGOOD DISEASE. T. Costa. *Políclinico*, July, 1916, Surg. Sect., No. 7, p. 215.

Costa, of the Royal University of Naples, reports a case of the above condition, which he places in the group of traumatic lesions, where, in addition to the trauma itself, the general weakness of the organic constitution has a part. His conclusions are based entirely on one case, with the typical history and clinical and radiographic findings, which would seem hardly sufficient basis for general conclusions.—W. G. Erving, *Washington, D. C.*

THE TREATMENT OF HIP FRACTURES. F. J. Cotton. *Boston Med. and Surg. Jour.*, September 28, 1916.

Cotton says, "the best way to be sure of satisfactory results in hip fractures is to have a system and a conviction, that makes it unnecessary to look up results." But the fact remains that results are wretched. Mortality is not small, and partial or total disability results in over fifty per cent. of hospital cases, with only slightly better results in private practice.

The trochanteric (extracapsular) type usually gets union, and deformity is the important consideration, while in the subcapital (intracapsular) the

question of union is most important. Uncertainty of union here is due to poor nutrition of the head and to the presence of synovial fluid. For the trochanteric class, any treatment works if it maintains moderate abduction. As the subcapital cases usually get bony union if they remain impacted, he employs, in the unimpacted ones, reduction and hammer impaction followed by plaster spica in moderate abduction. In thirty cases no harm was done, and the results were encouraging.—*R. Wallace Billington, Nashville.*

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THE IMPORTANCE OF EARLY REDUCTION OF FRACTURES WITH DISPLACEMENT.

William Darrach. *Boston Med. and Surg. Jour.*, Sept. 28, 1916.

A more exact replacement can be accomplished in the first few hours than after hemorrhage and reparative process have advanced. The percentage of perfect anatomical results will be much higher with early reduction. Early reduction is easier to accomplish and trauma is reduced. The evil effects of pressure of fragments on adjacent structures depend on duration as well as amount of pressure. More perfect reduction means shorter period of disability and more perfect function. Pain and discomfort are also lessened. One should not wait for X-ray examination more than a few hours. Second attempts at reduction, if necessary, should be immediate, within forty-eight hours at most. Radiography is important, radioscopy preferred. When open treatment is necessary, operation is delayed only a few days.—*R. Wallace Billington, Nashville.*

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DISABILITIES OF THE KNEE JOINT. R. Jones. *British Medical Journal*, Aug. 5, 1916.

A résumé of some of the common traumatic conditions found in the knee joint, from simple sprain of the lateral ligament to fractures into the joint. Emphasis is laid on the importance of careful after-treatment of these injuries. A very instructive article presenting certain phases of joint injury which are probably seen more frequently at present, incident to military service.—*Custis Lee Hall, Washington, D. C.*

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NAILS AND SCREWS THROUGH JOINT SURFACES, IN AUTOGRAFTS AND IN FRACTURES INTO JOINTS. Arthur T. Mann. *Jour. Amer. Med. Assn.*, Oct. 14, 1916, p. 1148.

This article reports the results of experiments on the knee joints of 12 dogs, in which the condyles had been fractured by chisel and then fastened to the shaft by nails and screws inserted through the articular surfaces. In all but one the autograft healed in place perfectly, being united by thin, firm callus, and appeared to be living (1½ to 3 months later), although microscopic section showed a gradual replacement by new bone from the vascular intertrabecular spaces. The nails and screws were firmly imbedded, and covered with new connective tissue resembling cartilage, the condyles tending to grow up around the exposed heads until they were buried, while grooves scratched in opposing joint surfaces were also filling in with hyaline cartilage. Two recent cases in which a similar operation was performed in man, with favorable outcome, are also cited.—*Eben W. Fiske, Pittsburgh.*

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BONE SETTING AND ITS MODERN REVIVAL. Norman D. Mattison. *New York Medical Journal*, July 15, 1916.

Mattison presents an interesting paper on the subject of bone setting. He takes up the history of the practice from its early date and relates some interesting facts concerning the men who first practised this art. The men referred to are Sweet, Kittredge, Dal Cin, Bruce-Clark, Still and others.

He discusses the theories and practice of the arts as applied to certain diseases and emphasizes the fact that most of these diseases are benefited by mechano-therapy. He states that osteopathic schools exist at the present time as separate entities, that the art should be embodied universally into the medical schools or that osteopathic schools should become graduate schools of medicine.

It is a pity that intelligent men will waste so much of their own and others' time in the futile discussion of an art which is simply a branch of therapeutics, many of the fundamental principles of which are as old as the human race. Why can't they be content in calling bone setting, osteopathy, spondylotherapy, chiropractic, napropathy, etc., mechano-therapy, belonging solely and exclusively to the medical science, to be administered at the discretion of the full-fledged physician.—*William Jackson Merrill, Philadelphia.*

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**THE FLEXED SPICA AND WHEEL CHAIR IN THE TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR.** G. A. Moore. *Boston Med. and Surg. Jour.*, Sept. 28, 1916.

The author has modified Whitman's method by applying the spica (either single or double) with the hip flexed as well as abducted. His results showed satisfactory maintenance of reduction of deformity and apposition of fragments, at the same time allowing his patients to sit in a chair. Of seventeen patients treated, 15 over fifty and nine over seventy years of age, only two died. Strength and general nutrition in the others were maintained so that after removal of the cast they were able to use crutches at once. The cast extends to the toes, the knee being flexed as well as the hip.—*R. Wallace Billington, Nashville.*

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**CERTAIN FACTS CONCERNING THE OPERATIVE TREATMENT OF FRACTURES OF THE PATELLA.** Charles L. Scudder and Richard H. Miller. *Boston Med. and Surg. Jour.*, Sept. 28, 1916.

A study of a series of unselected cases operated at the Massachusetts General Hospital. Of 22 cases radiographed, 81% had bony union, 19% ligamentous union. One sutured with silver wire, the others with silk, catgut or kangaroo tendon. Ligamentous union occurred because of absence of bony contact—the usual result after non-operative treatment. More accurate methods of reduction and fixation are needed, as shown by these results. It is desirable to use absorbable sutures when possible, but some cases require other means, such as Scudder's clamp, to hold fragments accurately coapted. Kangaroo tendon encircling fragments is generally satisfactory.—*R. Wallace Billington, Nashville.*

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**UNUSUAL SURGICAL CONDITIONS FOLLOWING TRAUMA.** E. P. Solomon. *International Journal of Surgery*, August, 1916.

The author reports three interesting cases:

Case 1—Osteochondroma of the femur in a big, strong boy; history of injury to knee and femur two years previous. On coming down stairs felt something pop above knee, giving severe pain. Examination proved the presence of tumor of femur, which ruptured through muscle and fascia. Operation showed a tumor mass as large as a baseball, non-malignant in type. Recovery uneventful.

Case 2—Separation of femoral epiphysis, with complete backward dislocation and severance of popliteal artery. Amputation necessary.

Case 3—Impacted fracture of body of the mandible. Patient struck on

chin by a jack-lever and rendered unconscious. No crepitation or abnormal mobility elicited. X-ray showed fracture and mal-alignment of teeth. Fracture reduced with good result.—*C. L. Lowman, Los Angeles, Calif.*

#### IX. MISCELLANEOUS DISEASES, GENERAL ORTHOPEDIC ARTICLES, PHYSICAL THERAPY, APPARATUS, ETC.

**OSTEOCLASIS AND OSTEOTOMY.** Wallace Blanchard. *Jour. Amer. Med. Assn.*, Aug. 12, 1916.

For osteoclasia the author uses a perfected Grattan osteoclast. He prefers osteoclasia to osteotomy on cases under 12 years old. The disadvantages of osteotomy are: the production of a compound instead of a simple fracture; time required for operation; danger of infection; time, care, and expense necessary for antiseptic precautions, and the pain of an open wound. But the most serious objection is delayed union. He claims this never occurs with rapid osteoclasia.

Care should be taken to be sure that subacute rachitis does not exist. This can be determined by X-ray. It can be relieved by raw food and fresh air.

Mild knock knee in children can be relieved by a slight supracondyloid bending of the femur without fracture.

Osteotomy should be done upon all cases over 12 years of age.

This article is well illustrated and thoroughly practical.—*F. G. Hodgson, Atlanta.*

**EXPERIMENTALLY TRANSPLANTED AND TRANSPOSED WHOLE METATARSAL BONES.**

W. L. Brown and C. P. Brown. *Jour. Amer. Med. Assn.*, Oct. 21, 1916, p. 1200.

The authors report a series of experiments on dogs, in which the whole metatarsal bone was in some instances transposed into its natural bed in the other foot, and in other cases transplanted into soft tissues, where it could not function. The transposed bones lived and grew, while the transplanted bones were absorbed. This proves the authors' contention, made in 1913, that permanency of bone transplants depends on their being able to assume their natural function, and disproves the conclusions which have been made following the experiments of Gill, that it was not necessary for transplants to be in contact with living osteogenetic tissue in order to live and functionate.—*Eben W. Fiske, Pittsburgh.*

**TREATMENT OF MUSCULAR RHEUMATISM.** William Fitch Cheney. *New York Medical Journal*, May 27, 1916.

Cheney presents an interesting article concerning the condition mis-called "muscular rheumatism." He quotes Lorenz, Schmidt, Muller, Luff, Rosenow and others in his preliminary discussion of the etiology and pathology of the affection. He laments that there is no opportunity to study the disease pathologically, inasmuch as it is rarely fatal. In quoting various men he discusses the question of pathology, giving various theories as to the process of the disease, but he draws no definite conclusions relative to the process. He believes that the disease is always toxic or infectious, and that it is dependent upon some focus in the body as a starting-point.

In treatment, he discusses rest, heat, purgation, salicylates, opiates and counter-irritation, etc.; in other words, all measures which improve elimination.

If Cheney would be content with calling this condition "myositis," and not use the word "rheumatism," which unfortunate word has given rise to a

great deal of misconception both on the part of physicians and the laity, it would help clear up some of the mists in this phase of medicine.—*William Jackson Merrill, Philadelphia.*

SOME CAUSES OF ERROR IN THE ROENTGEN DIAGNOSIS OF BONE AND JOINT LESIONS. Roland Hammond. *Amer. Jour. of Roentgenology*, August, 1916, iii, p. 385.

The author finds the errors in question to be due to a lack of: (1) knowledge of the laws of physics governing the Roentgen rays, and (2) a thorough knowledge of normal Roentgen anatomy, and the variations due to age and individuality. There is need of standardization in the making of bone and joint plates. Numerous examples are given of normal variation in bony structures, which are frequently diagnosed as pathological. Among others, the remains of the epiphyseal line at the lower end of the radius has been diagnosed as a healed fracture, and the area of increased radiability normally present in the greater trochanter of the femur has been erroneously called a bursa.—*Roland Hammond, Providence.*

A PLEA FOR THE PREVENTION OF DEFORMITIES IN THE HEALING OF BURNS. Charles A. Parker. *Jour. Amer. Med. Assn.*, Aug. 19, 1916.

Third degree burns, destroying the skin completely, but leaving the deeper structures intact, "however extensive they may be, as long as they are compatible with life, healing may and should be obtained without deformity and with good function." The limb should be fixed in the most desirable position during the process of healing and for some time thereafter to prevent subsequent contractions. Removable plaster casts are applied over the usual dressings. After separation of sloughs, strips of adhesive plaster are applied directly across the granulating ulcers and gauze applied over this. Persistent after-treatment is essential.—*F. G. Hodgson, Atlanta.*

## X. WAR SURGERY.

PREVENTIVE TREATMENT AND DANGERS OF TALIPES EQUINUS AFTER WAR WOUNDS OF THE LEGS. P. Audion. *Presse Médicale*, July 3, 1916, xxiv, No. 37, p. 292.

Usual causes of equinus are: (1), penetrating wounds of the popliteal space, of the tendo Achillis, or of the ankle; (2) plaster cast of leg holding foot in bad position; (3), continuous extension; (4) permanent flexion of the knee; and (5) wounds of the sciatic or external popliteal nerve.

The author emphasizes the fact that equinus is a severe deformity, that it resists stubbornly all forms of manipulative treatment, and that it is an avoidable deformity. He places special emphasis on the fact that in cases in which ankylosis is feared, the foot should be held in slight calcaneus.

Preventive treatment of leg in bed patients—if in plaster cast, foot to be kept in slight calcaneus. If not in plaster, passive motion, massage, and apparatus to keep the foot dorsally flexed, should be used. In ambulatory cases with nerve lesions, an apparatus to dorsally flex the foot. In cases without nerve lesions, over-correction in plaster cast followed by corrective apparatus.—*DeForest P. Willard, Philadelphia.*

THE TREATMENT OF SUPPURATIVE ARTHRITIS OF THE ELBOW JOINT FOLLOWING GUNSHOT WOUNDS. Léon Bérard. *Presse Médicale*, Aug. 10, 1916, xxiv, No. 45.

The majority of his cases he claims unfortunately come under observation

after forty-eight hours, when if they had been seen early, suppuration might have been prevented. Another drawback was the necessity of hurrying the patient away, when he fell, not infrequently, in willing but incompetent hands. On the whole, resections, as reported by several operators, have been successful, as 50% gave perfect results. Out of 5000 wounded since August, 1914, that came under his observation, 46 were wounds of the elbow; none were amputated when there did not exist lesion of some other member or of the viscera.

In wounds caused by small bullets, even where there existed fragmentation of the bones, immobilization with aseptic dressing was resorted to.

In suppurative arthritis he prefers total to partial resection.

He lays particular stress upon the straight incision of Ollier, as giving the freest access to the bone and preserving the periosteum, the ligaments and muscles. In 15 resections practised from three to five days after the injury, in 10 the results obtained were inferior to those that were practised early, owing to atrophy of the muscles, nevertheless satisfactory in point of solidity and mobility. He recommends complete resection, and not only removing the lower end of the humerus, and early passive motion without causing pain.

In a hard-working subject, where prolonged suppuration has left the limb atrophied and the elbow ankylosed, even at not the best angle, he prefers ankylosis to resection.

In a subject the opposite to the one above he advises resection.—*Daniel LaFerté, Detroit.*

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**PLASTER BED FOR THE LIMB TO PERMIT TRANSPORTATION AFTER COMPOUND FRACTURE.** A. Bernard. *Progrès Médical*, July 2, 1916, xxxii, No. 13.

Author recommends a plaster trough that will completely immobilize the injured limb, including joints above and below the fracture; this trough to have windows in it to allow the dressing of wounds. Does not believe in splints which cannot be made to fit the leg properly, and which, therefore, allow motion, nor in the circular plaster cast above and below the injured area connected by steel bars, which allow the fragments of bone to sag between the casts.—*DeForest P. Willard, Philadelphia.*

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**SOME ASPECTS OF TREATMENT OF COMPOUND FRACTURES UNDER CIVIL AND MILITARY CONDITIONS.** David Cheever. *Boston Med. and Surg. Jour.*, Sept. 28, 1916.

The presence or possibility of infection must take precedence in its demands over all other considerations of treatment, for methods, however skilful in fixation, which do not afford proper primary and subsequent treatment of the wound, are almost sure to result in disaster. War wounds present several problems more serious and difficult than those of civil practice, such as, more extensive comminution and tissue devitalization, more frequent and virulent infections, lack of prompt attention, greater shock, etc. Experience in the present European War has led to these conclusions: Free drainage; removal of bone fragments and devitalized soft tissue; disinfection by irrigations and dressings of solution of hypochlorous acid or sodium hypochlorite; primary fixation by splints, such as the Page or Thomas knee splint; plaster-of-Paris dressings only after infection subsides, as they are not suited to the early wound treatment; degree and virulence of infection in most cases preclude bone plating.—*R. Wallace Billington, Nashville.*

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**MARCH FRACTURE.** F. Eyles. *Münch. med. Woch.*, Dec. 7, 1915, lxii, No. 49.

This article is one of many on the cause of the so-called "Fussgeschwulst,"



about which there seems to be a difference of opinion in the German literature. This author agrees with others in attributing the trouble to a fracture in one of the metatarsals, usually the second or third, and supports his opinion by numerous radiographs.—*George I. Bauman, Cleveland.*

**SIMPLE MECHANOTHERAPY APPARATUS FOR MILITARY HOSPITALS.** Joseph Marshall Flint. *Surgery, Gynecology and Obstetrics*, August, 1916, p. 228.

The author describes, in detail, apparatus constructed from packing cases etc., which is used in many French military hospitals where Zander apparatus cannot be had.

The apparatus is used to mobilize joints, with the idea of evacuating more rapidly from the hospitals.

The article is too detailed to admit of its being abstracted in a form that would do it justice. It is recommended that it be read.—*Frank R. Ober, Boston.*

**CONTRACTURES OF HAND AFTER WOUNDS OF UPPER LIMB.** W. M. Macdonald. *British Medical Journal*, August 12, 1916.

Contractures of the hand following wounds in upper limb were considered by many neurologists as hysterical. Babinski believes that, added to the mental condition there is an organic lesion in the anterior cornual cells. Reflex origin of the contracture was assumed by Babinski. In twenty-five cases there was some evidence of neuritis in every case. Treatment consists of hot faradic baths, massage, manipulation and reëducation. Warning is given against too long retention in plaster, which will produce contraction of the opposing muscles.—*Custis Lee Hall, Washington, D. C.*

**LATER CARE OF INFECTED FRACTURES OF UPPER ARM AND THIGH.** E. Menne. *Munch. med. Woch.*, Jan. 11, 1916, lxiii, No. 2.

The per cent. of infected wounds in this war is unusually high. An infected compound fracture should be put up in complete immobilization, at the same time allowing free access to the wounds of the soft parts. For obvious reasons, extension is frequently impossible. A well-made plaster dressing with large windows fills most of the requirements in these cases. As a rule, at least three months must elapse before a sequestrum should be removed. As long as there is any fever, passive motion should not be started.—*George I. Bauman, Cleveland.*

**CONTINUOUS PROGRESSIVE GENTLE TRACTION BY SIMPLE MEANS IN TREATMENT OF STIFF JOINTS AND MUSCULAR CONTRACTURE.** J. Regnault. *Progrès Médical*, July 20, 1916, xxxii, No. 14, p. 123.

The author believes that slow, gentle traction will correct many stiff joints or contracted tendons. He gives in detail case histories and methods of applying gentle traction to the joints of the extremities.—*DeForest P. Willard, Philadelphia.*

**SAVING WOUNDED HANDS.** O. Witzel. *Munch. med. Woch.*, Dec. 7, 1915, lxii, No. 49.

Only the much stiffened hand, in which there is intense neuralgia that cannot be relieved, should be amputated.

Infection is to be most feared. To avoid this the wounded hand must be dressed frequently and carefully watched. Active and passive motion must be started early. These are usually carried out in a hot bath. Forceful manipulation must be avoided.—*George I. Bauman, Cleveland.*

# The American Journal of Orthopedic Surgery

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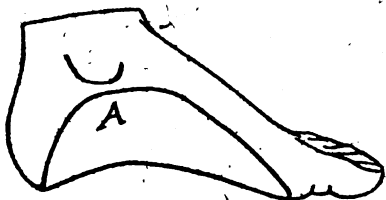
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